MANGROVES OF THE NORTHERN TERRITORY

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GLENN M. WIGHTMAN

NORTHERN TERRITORY BOTANICAL BULLETIN No. 7
CONSERVATION COMMISSION OF THE NORTHERN TERRITORY

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MANGROVES OF THE NORTHERN TERRITORY

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Cover: *Rhizophora stylosa*, Record Point, Cobourg Peninsula, May 1983, G.M. Wightman.

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INTRODUCTION

The primary aim of this book is to provide a means by which plants occurring in mangrove communities in the Northern Territory can be identified. Hence the inclusion of standard taxonomic tools such as keys, descriptions and drawings of the plants and notes on distribution and habitat of each species.

It is also intended that once the name of the plant has been established, something about the biology of individual species may be learnt. Thus detailed notes on reproductive biology, aboriginal usage, morphological variations and other pertinent information have been incorporated.

Introductory chapters on floristics, biogeography, utilization and conservation draw together data on these subjects from a community perspective.

It is hoped that this collection of information about mangrove species in the Northern Territory will provide a useful tool for future conservation and management decisions relating to this interesting and unusual plant community.

DEFINITION: The term mangrove is used to define both the plants that occur in tidal forests and the community itself (Tomlinson 1986). Generally there is no confusion about the contextual usage of the term, however some workers have attempted to rationalise the use of the term (Mepham & Mepham 1985). The term mangal has acquired some popularity to define the mangrove community (Macnae 1968, Chapman 1976). In this account, mangrove refers to the constituent species, whilst mangrove community or mangal are used to refer to the community as a whole.

A familiar difficulty when working with the mangrove community is to decide what is, and what is not, a mangrove. For the sake of this exercise a broad definition of what constitutes a mangrove has been used. Thus any vascular plant that regularly occurs in areas subject to tidal inundation in the Northern Territory is considered a mangrove. Many workers prefer to restrict mangroves to species that are obligately associated with areas subjected to tidal inundation and have an arborescent lifeform. The common practice of excluding all plants with non-arborescent life forms is artificial and based upon the historical meaning of the term mangrove (Mepham & Mepham 1986). Although the majority of authors still follow this precedent, some recent publications have included climbers and herbs (Chapman 1976, Bunt *et al.* 1982).

Northern Territory mangrove communities regularly contain a suite of species which have lifeforms other than trees or shrubs. For instance climbers (*Cynanchum carnosum, Dalbergia candenatensis* and *Derris trifoliata*), grasses (*Cynodon dactylon* and *Sporobolus virginicus*), epiphytes (*Amyema spp.* and *Lysiana maritima*), herbs and shrubs (*Halosarcia* spp. *Sesuvium portulacastrum, Suaeda arbusculoides* and *Batis argillicola*), a fern (*Acrostichum speciosum*) and a palm (*Nypa fruticans*). To exclude all or any of these species would result in a less realistic understanding of the mangrove flora of the Northern Territory.

Situations where mangrove species are found growing in non tidal and often well elevated habitats, are well documented (Beard 1967, van Steenis 1984 & Woodroffe 1988), similar instances are also known in the Northern Territory.

REGIONAL SETTING

CLIMATE: The coastal region of the Northern Territory is encompassed by Koppen's Aw and BSwh climatic types (Koppen 1936). These dry monsoonal climates are characterised by uniformly high temperatures and solar radiation with a highly seasonal rainfall regime, evaporation exceeds rainfall by some 600mm annually. The annual period of aridity is the dominant feature of the “Top End” climate (Taylor & Tulloch 1985).

Rainfall varies from 1800mm annually on Bathurst and Melville Islands to between 1000 - 1200mm on the southern coasts near the Western Australian and Queensland borders (Fig. 2). Moist north-westerly winds bring 90% of the annual rainfall during the "wet season' from November to April. The dry season, April to October, is virtually rainfree and characterised by dry south-easterly winds.

Temperatures are uniformly high along the entire Northern Territory coastline. Differences between maximum and minimum day and seasonal temperatures are more marked in the south-west and south-east parts of the coastline. However temperature regimes are conducive to mangrove growth and establishment throughout the year along the entire coastal region of the Northern Territory.

Cyclones typically occur during the wet season, high winds and storm surges associated with cyclonic depressions can have a devastating short term effect on mangrove communities. The long term effects of cyclone damage are poorly understood, however, mangrove forests dominated by Rhizophoraceous species recover more slowly than mixed forests (Bardsley 1985). The north east and south east coasts have a higher annual average number of cyclones than other coastal areas (Fig. 3).

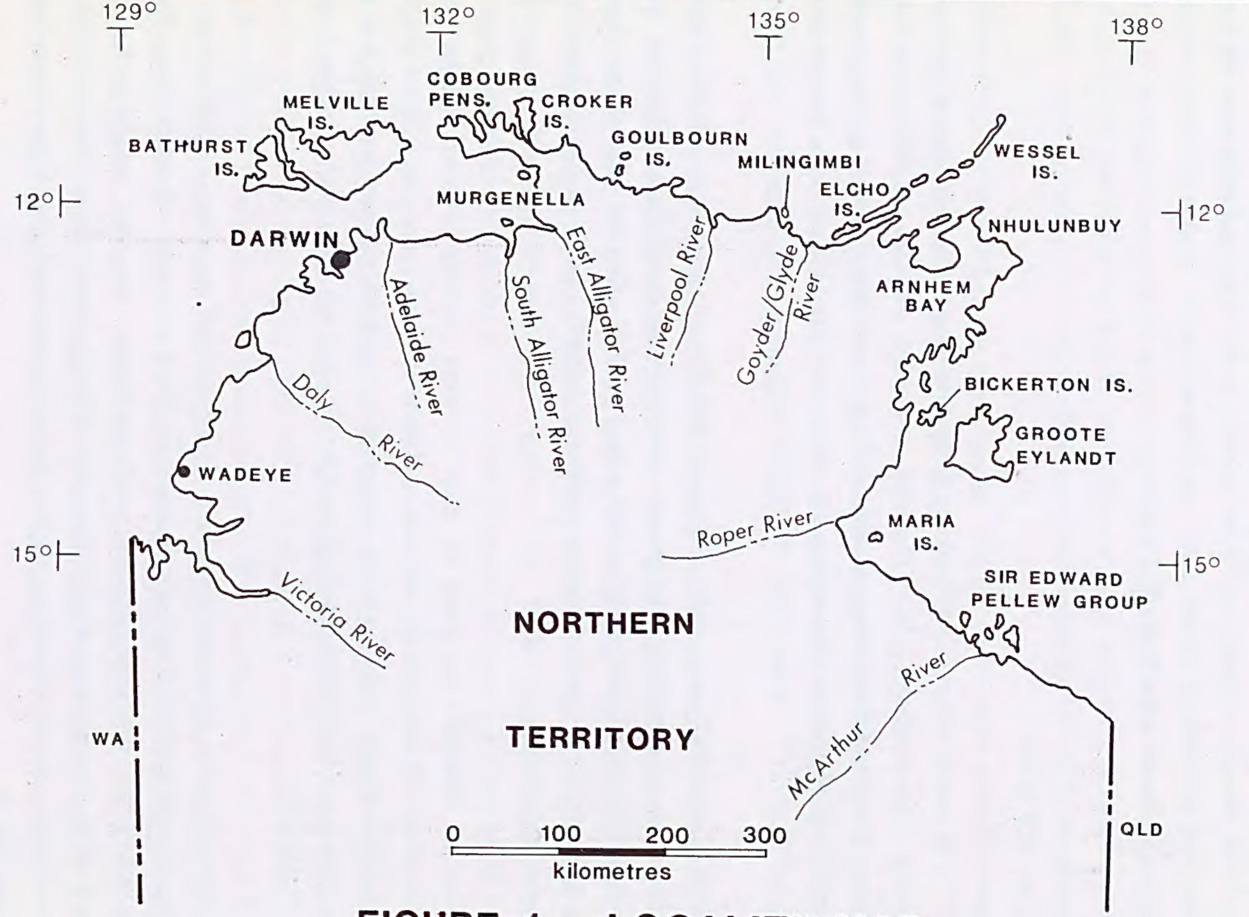


FIGURE 1 : LOCALITY MAP, NORTHERN TERRITORY COASTLINE

TIDE AND WAVE REGIMES: The tides of the Northern Territory coast are complex because of its position on the north east fringe of the Indian Ocean basin. Cases of diurnal and semidiurnal tides and mixtures of the two basic types occur along the coast (Knight 1986). Amplitudes are macrotidal and mesotidal, Darwin Harbor has a tidal range of about 8 metres, rise and fall in the Gulf of Carpentaria is usually below 1.5 metres. In other areas at some times of year tidal movement is negligible. Generally the northern coast is subjected to larger tidal amplitudes than the western and eastern coasts. (Radok 1976).

Wave regimes around the Northern Territory coastline are characteristically low energy (Radok 1976) and hence conducive to mangrove establishment and growth. Exposed north east facing coasts, such as the Wessel Islands and the base of Cobourg Peninsula, have moderate to high energy regimes.

Surface temperature of seawater in coastal regions of the Northern Territory varies from slightly above 28°C in January to between 22 - 25°C in July (Bunt 1987). Seawater surface salinity varies from 35.0 ppm. on the north and west coasts to 35.5 ppm. on the eastern coast of the Northern Territory (Bunt 1987).

COASTAL LANDFORMS: Landforms in coastal regions of the Northern Territory are characteristically low in elevation, all are less than 150 metres in elevation, the majority are less than 30 metres. Relief is low to negligible (Nix 1981), most landforms exhibit a low gradient, gradual dip toward the coast. Although in some cases sheer cliffs abut the ocean, for example at Murgenella, Cape Arnhem and some islands off the north east coast. Large portions of the coast are composed of floodplain, tidal flat and low relief plain landforms. Of the 22 600 kilometres of coastline in the Northern Territory, 15 150 kilometres are composed of estuary, tidal and supratidal mud or alluvium (Bunt 1987). The remainder is composed of low and high rocky terrain, dunes, beaches, ridge plains, non aeolian sand and laterite formations.

A feature of the coastal areas are the large macrotidal rivers which drain these low relief landforms, these rivers are in effect tidally influenced deltaic estuarine floodplains (Woodroffe *et al.* 1985). Examples of this include the West, South and East Alligator, Adelaide, McArthur and Victoria Rivers. The large tidal amplitude in conjunction with low relief coastal landforms and seasonal rainfall allow the effects of tide and salinity to penetrate up to 100 km inland at the end of the dry season. (Woodroffe *et al.* 1985).

SALINITY: Salinity is considered one of the major environmental factors affecting mangroves and mangrove communities. Mangroves are facultative rather than obligate halophytes; salinity favors them by excluding competitors (Flowers *et al.* 1986). Semeniuk (1985) suggested salinity as one of the major factors affecting the differential distribution of mangrove species in Darwin

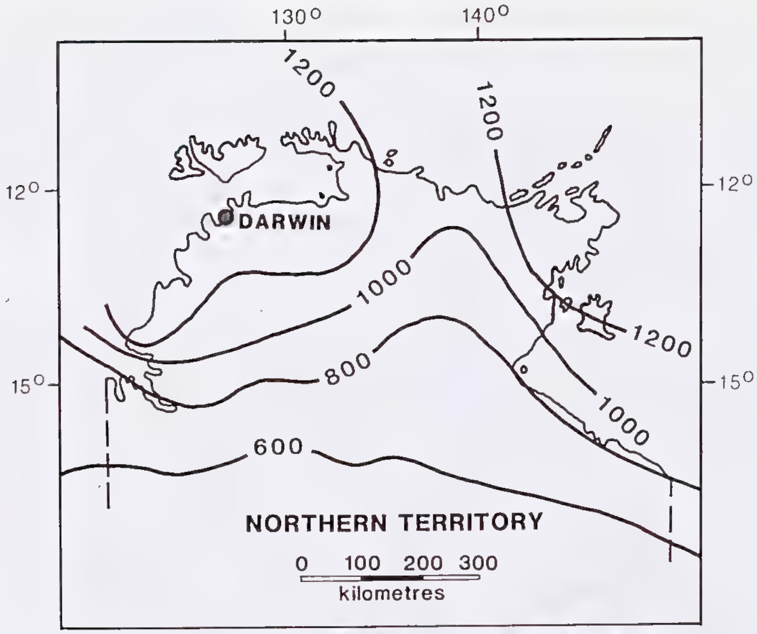


FIGURE 2 : ANNUAL RAINFALL NORTHERN TERRITORY COASTLINE
(After Lee & Neal 1984)

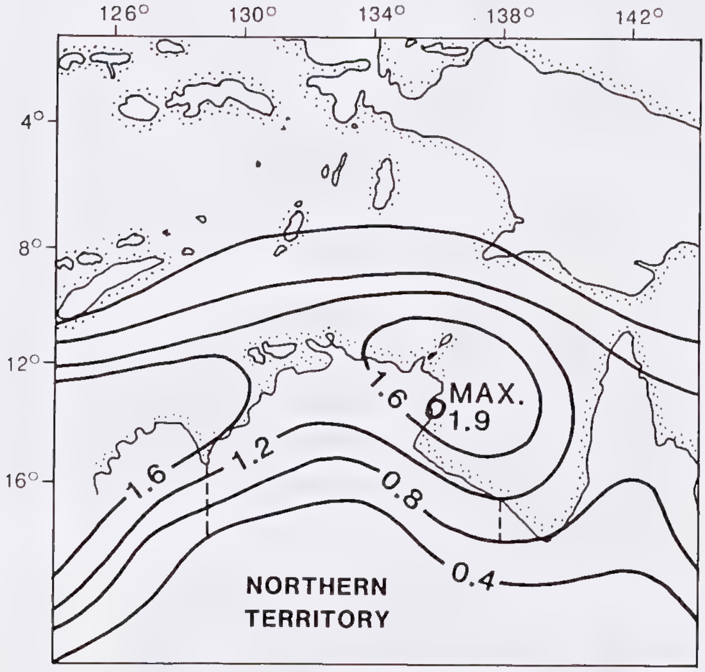


FIGURE 3 : TROPICAL CYCLONES PER YEAR (After Bunt 1987)

Harbour. Ball and Pidsley (1988) in a study of 16 species of tropical mangrove have shown that there are marked interspecific differences in both the range of salinity tolerances and the salinities at which growth is maximal. However little is known of the responses of tropical mangrove species to salinity. Most studies have been restricted to temperate populations of two cosmopolitan species, *Avicennia marina* and *Aegiceras corniculatum* (Connor 1969, Ball 1981).

Thus mangrove species differ in their tolerance to salinity; certain species flourish in saline or hypersaline regimes, whilst others prefer less saline, or almost fresh water, regimes. Bunt *et al.* (1982) examined salinity tolerances of mangrove species in north east Queensland and produced a list of mangrove species in order of salinity tolerances.

The majority of mangrove species that occur in the Northern Territory are capable of establishment and growth in areas that have a salinity equal to that of seawater. However a group of species also exists that requires water and soils with a salinity much lower than that of seawater. These species cannot survive in areas with seawater salinities and require freshwater input on a perennial basis. This group of "freshwater mangroves" includes *Bruguiera sexangula*, *Cynometra iripa*, *Nypa fruticans*, *Rhizophora apiculata*, *R. lamarckii*, *Sonneratia lanceolata* and *Xylocarpus granatum*.

Salinity of soil and water in coastal and estuarine areas is determined by several factors, the most important are length and regularity of tidal inundation, rainfall, evaporation and the amount of freshwater input from rivers and springs. A discussion of the complex interplay between these factors is beyond the scope of this work, however several points are worthy of comment.

Due to the markedly seasonal rainfall experienced by the Northern Territory coastal area, salinities of many areas vary throughout the year. For instance the large macrotidal river systems, such as the South Alligator River, oscillate between freshwater flood dominance during the wet season, to saline tidal estuaries toward the end of the dry season (Chappell & Ward 1985). This migrating freshwater/saltwater influence excludes any mangrove species that require a perennial freshwater input. However in situations where perennial freshwater springs occur in, or close to, tidal habitats, or where perennially strong flowing freshwater streams occur close to the coast, the saltwater/freshwater interface remains fairly stable. These situations provide a suitable salinity regime for the suite of "freshwater mangroves" previously mentioned. The important effect of perennial freshwater input on the floristics of mangrove communities in areas of seasonal rainfall has been discussed by Semeniuk (1983).

FLORISTICS

In this account 48 vascular plant species are recognised as being regular inhabitants of Northern Territory mangrove communities (Table 1).

Thus a group of plants with various degrees of fidelity to the mangrove community are incorporated. Species are categorised as having medium or high fidelity to the mangrove community in Table 2. Where applicable the vegetation type most commonly occupied other than the mangal is also given for each species. Again a degree of subjectivity is inevitable when one categorises these habitats, however the fact that these observations are based on the author's field experiences in the Northern Territory is emphasized. These assessments are not necessarily correct for other areas outside Australia, nor indeed for other parts of Australia. Table 2 also presents a categorisation of species based upon their most commonly exhibited lifeform.

As an aid to identification, and a guide to the floristic diversity found in Northern Territory mangrove communities, Table 3 presents a list of plants that occur in these communities, but not on a regular basis. This list is arranged alphabetically by genus and species with appropriate authority and family. Whilst this list is far from exhaustive it does highlight the continuity of community types and the inherent difficulties of placing species unequivocally in habitat types.

From a global perspective Mepham & Mepham (1985) list 400 arborescent and 500 non-arborescent species as occurring in mangrove communities in the Indo-West Pacific region. In a more conservative estimate, Tomlinson (1986) records 66 genera and 94 species of mangroves and mangrove associates in the world. Again the disparity between these figures emphasizes the subjectiveness and difficulties of defining a mangrove.

In an Australian context recent workers (using various criteria to define a mangrove) have considered that the mangrove communities of Australia contain 45 taxa (Bunt *et al.* 1982), 38 species (Busby & Bridgewater 1986) and 40 species (Smith & Duke 1987).

On a regional basis it is generally considered that the most floristically diverse mangrove communities in Australia occur in north-east Queensland, and that mangrove communities become less rich in species to the south and the west. Bunt *et al.* (1982) report 45 taxa from Queensland, whilst West *et al.* (1984) list 5 species from New South Wales and Semeniuk *et al.* (1978) record 16 species from Western Australia. One species, *Avicenia marina*, occurs in Victoria and South Australia. No species are reported from Tasmania.

In the Northern Territory, Wells (1982) recorded 25 species of mangrove, in this account 48 species are treated. The increase in species is in part due to a broader definition of what constitutes

TABLE 1: NORTHERN TERRITORY MANGROVE SPECIES

Acanthus ebracteatus Vahl	ACANTHACEAE
Acanthus ilicifolius L.	ACANTHACEAE
Acrostichum speciosum Willd	PTERIDACEAE
Aegialitis annulata R.Br.	PLUMBAGINACEAE
Aegiceras corniculatum (L.) Blanco	MYRSINACEAE
Amyema mackayense (Blakely) Danser	LORANTHACEAE
Amyema thalassium Barlow	LORANTHACEAE
Avicennia integra N.C. Duke	VERBENACEAE
Avicennia marina (Forsskal) Vierh.	VERBENACEAE
Batis argillicola P. Royen	BATACEAE
Bruguiera exaristata Ding Hou	RHIZOPHORACEAE
Bruguiera gymnorrhiza (L.) Savigny	RHIZOPHORACEAE
Bruguiera parviflora (Roxb.) Wight & Arn. ex. Griff.	RHIZOPHORACEAE
Bruguiera sexangula (Lour.) Poiret	RHIZO-PHORACEAE
Camptostemon schultzii Masters	BOMBACACEAE
Ceriops decandra (Griffith) Ding Hou	RHIZOPHORACEAE
Ceriops tagal (Perr.) C. Robinson	RHIZOPHORACEAE
var australis C. White	
var tagal	
Cynanchum carnosum (R.Br.) Schltr.	ASCLEPIADACEAE
Cynodon dactylon (L.) Pers.	POACEAE
Cynometra iripa Kostel	CAESALPINICEAE
Dalbergia candenatensis (Dennst.) Prain	FABACEAE
Derris trifoliata Lour.	FABACEAE
Diospyros compacta (R. Br.) Kosterm	EBENACEAE
Diospyros littorea (R. Br.) Kosterm	EBENACEAE
Excoecaria agallocha L.	EUPHORBIACEAE
Excoecaria ovalis Endlicher	EUPHORBIACEAE
Haloscarcia halocnemoides (Nees) Paul G. Wilson	CHENOPODIACEAE
Halosarcia indica (Willd.) Paul G. Wilson	CHENOPODIACEAE
Hibiscus tiliaceus L.	MALVACEAE
Lumnitzera littorea (Jack) Voigt	COMBRETACEAE
Lumnitzera racemosa Willd.	COMBRETACEAE
Lysiana maritima (Barlow) Barlow	LORANTHACEAE
Nypa fruticans Wurmb.	ARECACEAE
Osbornia octodonta F. Muell.	MYRTACEAE
Pemphis acidula Forster & Forster f.	LYTHRACEAE
Rhizophora apiculata Blume	RHIZOPHORACEAE
Rhizophora lamarckii Montr.	RHIZOPHORACEAE
Rhizophora stylosa Griffith	RHIZOPHORACEAE
Scyphiphora hydrophylacea Gaertner	RUBIACEAE
Sesuvium portulacastrum L.	AIZOACEAE
Sonneratia alba J. Smith	SONNERATIACEAE
Sonneratia lanceolata Blume	SONNERATIACEAE
Sporobolus virginicus (L.) Kunth.	POACEAE
Suaeda arbusculoides L.S. Smith	CHENOPODIACEAE
Tecticornia australasica (Moq.) Paul G. Wilson	CHENOPODIACEAE
Thespesia populneoides (Roxb.) Kostel.	MALVACEAE
Xylocarpus granatum Konig	MELIACEAE
Xylocarpus mekongensis Pierre	MELIACEAE

TABLE 2: MANGROVE SPECIES, CATEGORISATION OF LIFE FORM AND FIDELITY.

SPECIES	LIFE FORM	DEGREE OF FIDELITY TO TO MANGROVE (H:HIGH; M:MODERATE)	PREFERRED HABITAT OTHER THAN MANGROVE COMMUNITY
Acanthus ebracteatus	Shrub, perrenial	H	
Acanthus ilicifolius	Shrub, perennial	H	
Acrostichum speciosum	Fern, perennial	M	Coastal cliffs/swamps
Aegialitis annulata	Shrub, evergreen	H	
Aegiceras corniculatum	Shrub, evergreen	H	
Amyema mackayense	Epiphyte	H	
Amyema thalassium	Epiphyte	H	
Avicennia integra	Tree/shrub, evergreen	H	
Avicennia marina	Tree, evergreen	H	
Batis argillicola	Forb, perennial	M	Hypersaline sand flats
Bruguiera exaristata	Tree, evergreen	H	
Bruguiera gymnorrhiza	Tree, evergreen	H	
Bruguiera parviflora	Tree, evergreen	H	
Bruguiera sexangula	Tree, evergreen	H	
Camptostemon shultzii	Tree, evergreen	H	
Ceriops decandra	Shrub, evergreen	H	
Ceriops tagal	Shrub, evergreen	H	
Cynanchum carnosum	Climber, perennial	H	
Cynodon dactylon	Grass, perennial	M	Coastal plains
Cynometra iripa	Tree, evergreen	H	
Dalbergia candenatensis	Climber, perennial	H	
Derris trifoliata	Climber, perennial	H	
Diospyros compacta	Tree, evergreen	M	Coastal monsoon forests
Diospyros littorea	Tree, evergreen	M	Coastal monsoon forests
Excoecaria agallocha	Tree, s/deciduous	H	
Excoecara ovalis	Tree, s/deciduous	H	
Haloscarcia halocnemoides	Forb, perennial	M	Hypersaline sand flats
Halosarcia indica	Forb, perennial	M	Hypersaline sand flats
Hibiscus tiliaceus	Tree, evergreen	M	Coastal monsoon forests
Lysiana maritima	Epiphyte	H	
Lumnitzera littorea	Tree, evergreen	H	
Lumnitzera racemosa	Tree/shrub, evergreen	H	
Nypa fruticans	Palm	H	
Osbornia octodonta	Shrub, evergreen	H	
Pemphis acidula	Shrub/tree, evergreen	M	Coastal rock outcrops
Rhizophora apiculata	Tree, evergreen	H	
Rhizophora lamarckii	Tree, evergreen	H	
Rhizophora stylosa	Tree, evergreen	H	
Scyphiphora hydrophylacea	Shrub, evergreen	H	
Sesuvium portulacastrum	Forb, perennial	M	Floodplains/sand flats

TABLE 2: (CONT.)

SPECIES	LIFE FORM	DEGREE OF FIDELITY TO TO MANGROVE (H:HIGH; M:MODERATE)	PREFERRED HABITAT OTHER THAN MANGROVE COMMUNITY
Sonneratia alba	Tree, evergreen	H	
Sonneratia lanceolata	Tree, evergreen	H	
Sporobolus virginicus	Grass, perennial	M	Floodplains/sand flats
Suaeda arbusculoides	Forb, perennial	M	Hypersaline sand flats
Tecticornia australasica	Forb, annual	M	Hypersaline sand flats
Thespesia populneoides	Tree, perennial	M	Coastal riverine areas
Xylocarpus granatum	Tree, deciduous	H	
Xylocarpus mekongensis	Tree, deciduous	H	

TABLE 3; SPECIES THAT OCCASIONALLY OCCUR IN NORTHERN TERRITORY MANGROVE COMMUNITIES.

Acacia holosericea Cunn. ex Benth.	MIMOSACEAE
Barringtonia acutangula (L.) Gaertner	LECYTHIDACEAE
Caesalpinia bonduc (L.) Roxb.	CAESALPINIACEAE
Casuarina equisetifolia Forster & Forster f.	CASUARINACEAE
Capparis sepiaria L.	CAPPARACEAE
Cathormion umbellatum (Vahl.)Kosterm.	MYRTACEAE
Cladium procerum S.T. Blake	CYPERACEAE
Clerodendrum inerme (L.) Gaertner	CYPERACEAE
Colubrina asiatica (L.) Brogn.	RHAMNACEAE
Cyperus javanicus Houtt.	CYPERACEAE
Cyperus polystachyos Robbt.	CYPERACEAE
Cyperus stoloniferous Retz.	CYPERACEAE
Dendrobium affine Steudal	ORCHIDACEAE
Eleocharis dulcis (Burman f.) Henschel	CYPERACEAE
Flagellaria indica L.	FLAGELLARIACEAE
Fimbristylis cymosa R. Br.	CYPERACEAE
Fimbristylis ferruginae Vahl.	CYPERACEAE
Fimbristylis rara R. Br.	CYPERACEAE
Gymnanthera nitida R. Br.	ASCLEPIADACEAE
Livistona benthamii Bailey	ARECACEAE
Melaleuca acacioides F. Muell	MYRTACEAE
Melaleuca leucadendra (L.) L.	MYRTACEAE
Pluchea indica Less.	ASTERACEAE
Salsola kali L.	CHENOPODIACEAE
Schoenoplectus littoralis (Schrader) Palla	CYPERACEAE
Sophora tomentosa L.	FABACEAE
Sphaeranthus africanus L.	ASTERACEAE
Thespidium basiflorum (F.Muell.) F. Muell. ex Benth.	ASTERACEAE
Thoracostachyum sumatrum (Miq.) Kurz	CYPERACEAE
Typha domingensis Pers.	TYPHACEAE
Xerochloa imberbis R.Br.	POACEAE

a mangrove being used here, Wells followed a stricter set of criteria for determination of mangrove and non-mangrove taxa. However several species have been recorded from the Northern Territory since the publication of Well's material. These include *Acanthus ebracteatus, Cynometra iripa, Dalbergia candenatensis, Excoecaria ovalis, Lysiana maritima* and *Rhizophora lamarckii.*

Nomenclature follows that of Dunlop (1987), though subsequent taxonomic and nomenclatural changes have been incorporated. Collections of all specimens are housed in the Northern Territory Herbarium (DNA).

BIOGEOGRAPHY

DISTRIBUTION OF MANGROVE COMMUNITIES IN THE NORTHERN TERRITORY

Mangrove communities cover approximately 4 120 km^2 of coast and river systems on the mainland and islands of the Northern Territory (Galloway 1982). This represents 35% of the total area of mangal in Australia. The mangrove communities of Queensland [4 602 km^2 (Galloway 1982)] and the Northern Territory combined constitute 75% of the mangrove communities found in Australia.

The distribution of mangrove communities in the Northern Territory is presented in Fig 4. For ease of presentation the coverage of mangal was quantified into four categories per 0.5 degree x 0.5 degree grid cell. The largest areas of mangals occur on the northern coasts, especially dense areas occur on the northern coasts of Arnhem Land, in Darwin Harbour and on Bathurst and Melville Islands. The south-west and south-east coasts near the Northern Territory borders have a relatively low coverage of mangrove communities.

DISTRIBUTION OF MANGROVE SPECIES IN THE NORTHERN TERRITORY

The distribution of mangrove species is presented in Table 4, in the form of presence/absence of species in 1 degree by 1 degree grid cells along the coastline. The location of grid cells, with total number of species per grid cell and per degree of latitude and longitude is presented in Figure 5. This table and figure give an overall view of the relative floristic diversity of the Northern Territory coastline.

The data used to produce Table 4 and Figure 5 were derived from the collection localities of mangrove specimens housed in various Australian herbaria. These included the Northern Territory Herbarium (DNA and NT), the Australian National Herbarium (CANB), the Queens-

TABLE 4: DISTRIBUTION OF MANGROVE SPECIES IN THE NORTHERN TERRITORY (SEE FIG 5. FOR LOCATION OF GRID CELLS).

SPECIES	GRID CELL NUMBER																						TOTAL GRID CELLS
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
Acanthus ebracteatus							*	*	*	*			*	*									6
Acanthus ilicifolius						*	*	*		*	*		*		*						*		8
Acrostichum speciosum	*		*	*		*		*	*	*	*		*	*	*	*		*			*		14
Aegialitis annulata	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	22
Aegiceras corniculatum	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	22
Amyema mackayense			*		*	*	*	*	*	*	*			*		*					*		11
Amyema thalassium						*		*						*									3
Avicennia integra						*	*	*	*	*													5
Avicennia marina	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	22
Batis argillicola						*		*							*		*				*	*	7
Bruguiera exaristata	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	22
Bruguiera gymnorrhiza	*	*	*	*	*	*	*	*	*	*	*			*	*						*		14
Bruguiera parviflora		*	*	*	*	*	*	*	*	*	*			*	*		*	*			*		15
Bruguiera sexangula											*												1
Camptostemon shultzii			*	*		*	*	*	*	*	*		*			*							10
Ceriops decandra	*					*	*	*	*	*	*												7
Ceriops tagal	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	22
Cynanchum carnosum	*		*	*		*	*	*	*	*	*			*	*	*	*						13
Cynodon dactylon				*		*	*	*			*		*						*				7
Cynometra iripa											*			*									2
Dalbergia candenatensis	*		*			*			*		*												5
Derris trifoliata			*				*	*	*		*				*								6
Diospyros compacta	*		*			*	*	*	*		*		*		*								9
Diospyros littorea	*	*				*	*	*	*	*	*			*			*				*		11
Excoecaria agallocha		*	*	*							*				*		*						6
Excoecara ovalis	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	22
Haloscarcia halocnemoides						*				*									*	*		*	5
Halosarcia indica	*					*		*	*	*	*					*	*			*	*	*	11

TABLE 4 (cont.)

SPECIES	GRID CELL NUMBER 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	TOTAL CELLS
Hibiscus tiliaceus	*	*	*	*	*	*	*	*	*	*	*			*	*		*				*	*	16
Lumnitzera littorea	*	*	*			*			*	*	*							*			*		9
Lumnitzera racemosa	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	22
Lysiana maritima														*			*						2
Nypa fruticans	*	*																					2
Osbornia octodonta	*	*	*	*		*	*	*	*	*	*			*	*	*	*	*		*	*	*	18
Pemphis acidula		*	*			*		*		*	*				*		*			*	*		10
Rhizophora apiculata	*	*	*	*		*	*	*	*		*												9
Rhizophora lamarckii	*		*				*	*	*														5
Rhizophora stylosa	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	22
Scyphiphora hydrophylacea	*	*	*		*	*			*	*	*				*		*						10
Sesuvium portulacastrum	*		*	*	*	*		*	*	*	*			*			*	*		*	*	*	15
Sonneratia alba	*		*	*	*	*	*	*	*	*	*				*	*							12
Sonneratia lanceolata	*							*			*												3
Sporobolus virginicus				*		*		*	*	*	*		*	*	*	*	*			*	*		13
Suaeda arbusculoides				*				*		*			*										4
Tecticornia australasica			*			*	*	*	*	*	*							*			*		9
Thespesia populneoides	*	*	*	*	*	*	*	*		*	*			*	*	*				*	*		15
Xylocarpus granatum	*	*									*												3
Xylocarpus mekongenis	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	22
TOTAL SPECIES PER CELL	**29**	**22**	**30**	**22**	**18**	**38**	**29**	**38**	**33**	**34**	**39**	**10**	**17**	**22**	**25**	**18**	**23**	**15**	**11**	**16**	**26**	**15**	

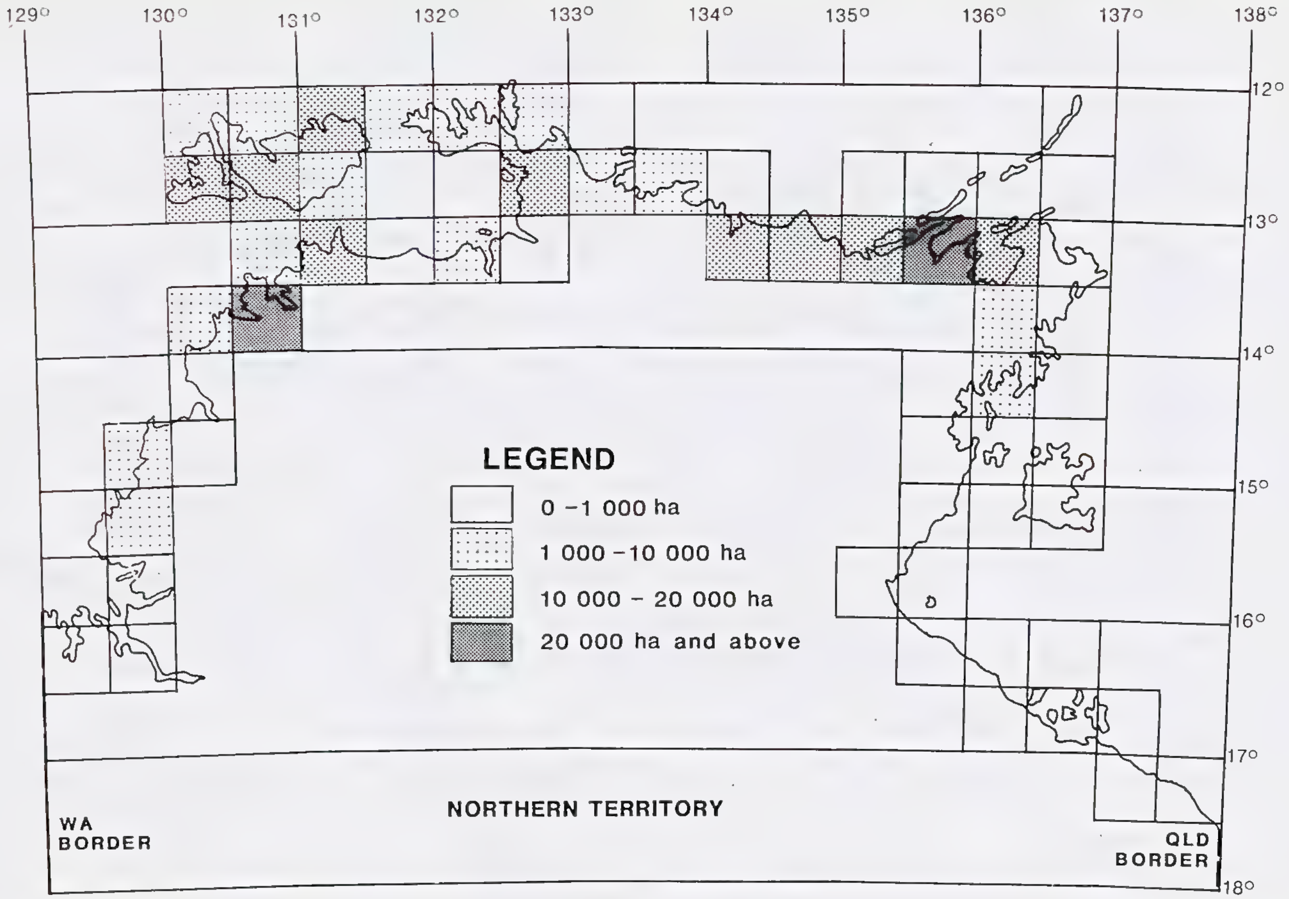


FIGURE 4 : MANGROVE COMMUNITY COVERAGE IN THE NORTHERN TERRITORY
(After Dames & Moore 1984)

land Herbarium (BRI), the Western Australian Herbarium (PERTH) and the Australian Institute of Marine Sciences Herbarium (AIMS).

A full discussion of these results is beyond the scope of this account, however several interesting trends deserve mention.

Nine mangrove species occur in all grid cells along the coast of the Northern Territory. These are *Aegialitis annulata, Aegiceras corniculatum, Avicennia marina, Bruguiera exaristata, Ceriops tagal, Excoecaria ovalis, Lumnitzera racemosa, Rhizophora stylosa* and *Xylocarpus mekongensis*. Eighteen species occur in 12 or more grid cells, 37 species occur in six or more grid cells.

A suite of eleven species occur in five or less grid cells. These species together with the total number of known populations, their Australian and extra-Australian distribution are presented in Table 5. Of these eleven species, six require a perennial freshwater input to survive. As discussed in the introduction this habitat is uncommon in the Northern Territory. These species are *Bruguiera sexangula, Cynometra iripa, Nypa fruticans, Rhizophora lamarckii, Sonneratia lanceolata* and *Xylocarpus granatum*. The most restricted mangrove species in the Northern Territory are *Bruguiera sexangula, Cynometra iripa* and *Nypa fruticans*.

The relative floristic richness of the Northern Territory coast is presented in Figure 5. The northern coasts are richer in species than the southern coasts, the east coast is generally richer than the west coast. The most floristically diverse mangrove communities occur in the Darwin region (38 species), the Alligator Rivers region (38 species) and the Arnhem Bay/Nhulunbuy region (39 species). Mangrove communities that occur on the south-west and south-east coastlines, near the Northern Territory borders, are floristically depauperate in comparison to the northern coast mangals.

The grid cell encompassing Arnhem Bay and Nhulunbuy on the north east coast of Arnhem Land contains the most floristically diverse mangrove communities in the Northern Territory. Several species of highly restricted distribution occur in this area, eg. *Bruguiera sexangula* which is not known to occur in any other grid cell and *Cynometra iripa* which is known from one other grid cell. Two hybrids are also known from single collections within this grid cell, and are not known to occur any where else in the Northern Territory. These are *Bruguiera exaristata* x *B. gymnorrhiza* and *Sonneratia alba* x *S. lanceolata*. These hybrids are discussed in detail in the Taxonomic section under the relevant genus.

TABLE 5: MANGROVES WITH A RESTRICTED DISTRIBUTION IN THE NORTHERN TERRITORY.

SPECIES	NUMBER OF GRID CELLS	NUMBER OF KNOWN POPULATIONS	AUSTRALIAN DISTRIBUTION	EXTRA AUSTRALIAN DISTRIBUTION
Amyema thalassium	3	5	WA	Endemic
Avicennia integra	5	6	N.T. Endemic	Endemic
Bruguiera sexangula	1	5	QLD	India, S.E.Asia, New Guinea.
Cynometra iripa	2	3	QLD	India, S.E. Asia
Halosarcia halocnemoides	5	5	WA, QLD, SA	Endemic
Lysiana maritima	3	4	QLD	Endemic
Nypa fruticans	2	3	QLD	S.E. Asia, west Pacific, New Guinea
Rhizophora lamarckii	5	5	QLD	Sri Lanka, S.E. Asia, New Guinea
Sonneratia lanceolata	3	7	QLD	New Guinea
Suaeda arbusculoides	4	6	QLD, WA	Endemic
Xylocarpus granatum	3	6	QLD, ?WA	Old World Tropics

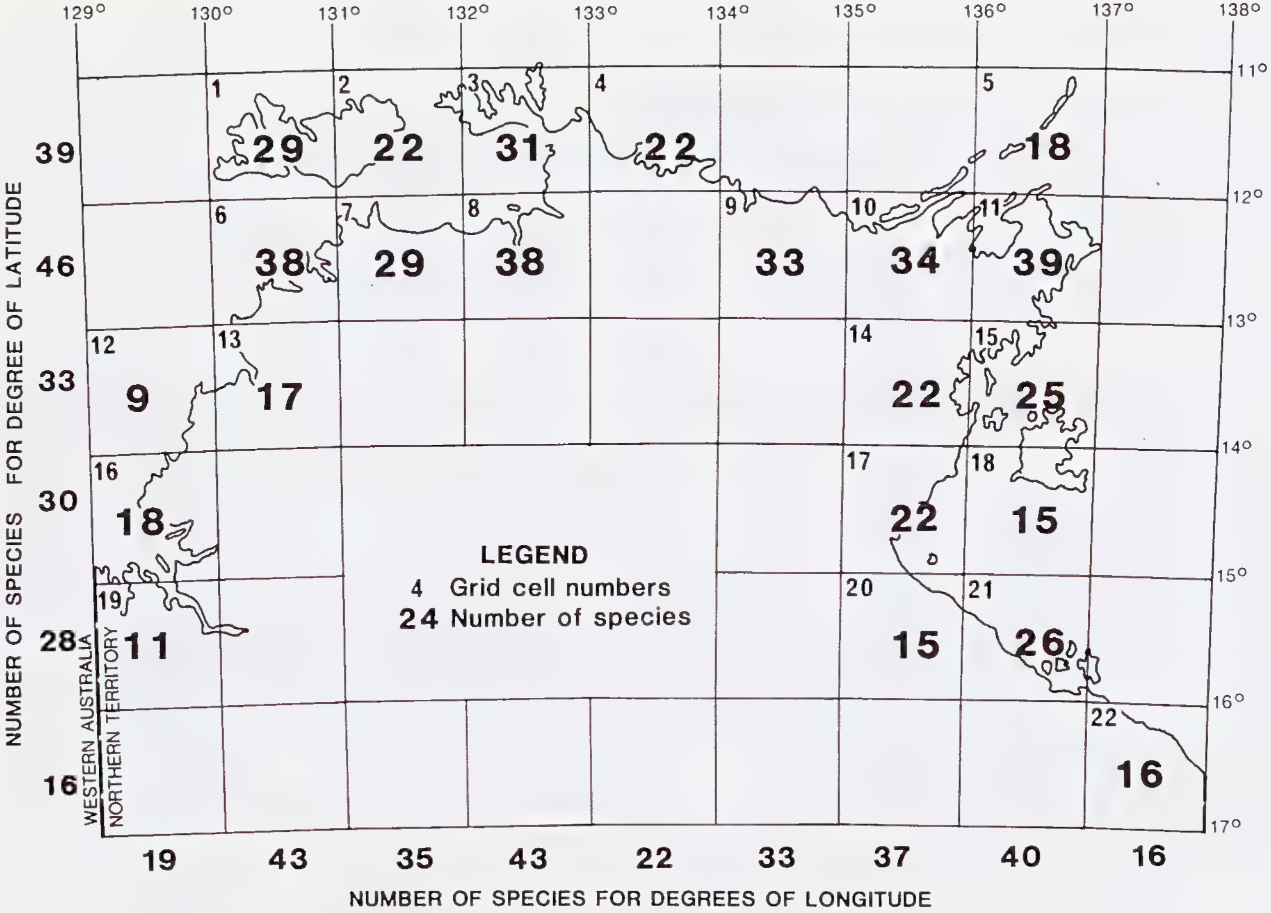


FIGURE 5 : NUMBER OF MANGROVE SPECIES PER 1° x 1° GRID CELL OF LATITUDE AND LONGITUDE IN THE NORTHERN TERRITORY

UTILISATION AND CONSERVATION

The mangrove community has been, and is, an important resource for Aboriginals living in coastal areas of the Northern Territory (Davis 1985, Meehan 1982). Apart from the plants, which provide food, medicine and implements (refer to notes in Taxonomy section), there is also a large faunal food resource (Meehan 1982). Many fish, including barramundi (*Lates calcarifer*), mangrove jack (*Lutjanus argentimaculatus*), bream (*Mulio berda*), javelin fish (*Pomadasys hasta*), four species of mullet and several species of catfish are common estuary and mangrove swamp inhabitants (Finlayson *et al.* 1988). Shellfish (many taxa), clams (*Gelona coaxans* and *Batissa violacea*), mudcrabs (*Scylla serrata*) and mangrove worms (*Teredo* spp.) are further important food sources found in mangrove communities (Meehan 1982).

Macassan trepangers visited the coast of the Northern Territory from about 1700-1907 (MacKnight 1976). Timber from mangrove trees was used to fuel stoves and driers and an abundance of such timber was an important criterion for selection of camp sites (MacKnight 1976).

More recently, some of the mangrove resources, especially fish, shellfish and mudcrabs, have been utilized by a larger non Aboriginal population, mostly in the vicinity of urban centres such as Darwin and Nhulunbuy. There is little published data on the effects that this localised utilisation is having on the resource. However Grey and Griffen (1979) observe that the 3,400 professional and amateur fishermen in the Northern Territory appear to have fished several river systems beyond their maximum sustainable yield. These impacts on fauna do not appear to have affected the mangrove flora itself, though no detailed studies have been undertaken.

Mangrove communities in the Northern Territory are not subjected to the developmental pressure experienced elsewhere in Australia (Singer and Wright 1985) or internationally (Tomlinson 1986) due to the relatively low population and extensive mangrove resource. The majority of the Northern Territory coast is remote from large population centres and is free from associated development pressure.

Land tenure along much of the Northern Territory coast (approximately 70%) is Aboriginal Land (eg. Arnhem Land, Tiwi Islands and Daly River Reserve) and jointly managed National Park (eg, Kakadu and Cobourg Peninsula). Coastal development within these areas in the past has been restricted to localised clearing associated with building docking facilities to service mining operations, eg. Nhulunbuy and Alyangula, Groote Eylandt. However several future threats appear to exist within these areas. These include the disposal of impounded waters from tailings dams at Groote Eylandt and future mining operations on the east coast of Arnhem Land in the Blue Mud Bay area. The tenure of the remaining coastal region (approx. 30%), is freehold pastoral. Development within these areas is difficult to assess or predict.

The major current threat to Northern Territory mangrove assemblages appears to be restricted to localised areas in the vicinity of Darwin (Finlayson *et al.* 1988) and especially within Darwin Harbour. Threats arise from nutrient enrichment, construction of causeway embankments, destruction of mangroves for land reclamation and changes to hydrology and salinity regimes associated with drainage programs (Dames and Moore 1984). Further pressure is expected to come from future recreational, residential and industrial developments within the harbour (Finlayson *et al.* 1988).

The mangrove communities of Darwin Harbour are some of the most floristically diverse in the Northern Territory (refer to Biogeography section). Thirty eight species are recorded from the one degree grid cell encompassing Darwin Harbour which also represents one of the largest expanses of mangrove vegetation in the Northern Territory. Although no rare or restricted species of mangrove occur in Darwin Harbour, the diversity and extent of the mangrove community places it amongst the most significant mangrove resources in the Northern Territory.

Darwin Harbour has been the focus of several studies on mangrove ecolgy (eg. Thomson 1970, LeProvost *et al.* 1982, Semeniuk 1985) and many local Enviromental Impact Statements (see Dames and Moore 1984 for full listing). However little is known about the response of mangrove species and communities to disturbance, other than some references to the effects of sewerage (Dames and Moore 1981) and cyclonic winds (Stocker 1976, Bardsley 1985).

The Northern Territory Government, in recognising the need to conserve mangrove and coastal environments, has developed a coastal management policy aimed at achieving a coordinated and effective approach to coastal management issues (Singer and Wright 1985). A mangrove resource data base has been established (Dames and Moore 1984) in an effort to collate all available data on mangrove and coastal enviroments in the Northern Territory. This has since been supplemented by more detailed studies on Darwin Harbour resources, culminating in a recent coastal management objective for the Darwin Harbour mangroves, which identifies zones suitable for development and various levels of conservation for future planning.

TAXONOMY

MANGROVE IDENTIFICATION.

Mangroves may be identified using the following keys.

Key 1 is intended for field use and is based on vegetative characters. Sterile specimens may be identified using this key in the field, or by taking relevant field notes and using the key in the herbarium or laboratory.

Key 2 is intended for herbarium or laboratory use when field data are lacking. Fertile specimens are required to successfully operate this key.

Keys to genera with more than one species may be found in the generic circumscription of the relevant genus in the following pages.

A further guide to mangrove identification, in the form of an illustrated fold out chart, is located inside the back cover. This chart is intended for use primarily in the field and should be used only as a guide to identification.

Plants identified using the keys or chart should be checked against the appropriate description and illustration.

KEY 1

1. Fern .... *Acrostichum speciosum*
1. Grass 2
1. Palm .... *Nypa fruticans*
1. Aerial stem parasite 3
1. Succulent herb 4
1. Tree, shrub, scrambler or climber 8

2. Stems prostrate, mat forming; inflorescence 3-5 armed .... *Cynodon dactylon*
2. Stems below ground, foliage erect; inflorescence spike like .... *Sporobolus virginicus*

3. Leaves < 22 mm wide; corolla divided to base .... *Amyema* spp.
3. Leaves > 25 mm wide; corolla divided to middle .... *Lysiana maritima*

4. Plant with obvious leaves 5
4. Plant apparently leafless 7

5. Plant erect; flowers inconspicuous, green-yellow 6
5. Plant prostrate; flowers conspicuous, pink. .... *Sesuvium portulacastrum*

6. Leaves opposite .... *Batis argillicola*
6. Leaves alternate .... *Suaeda arbusculoides*

7. Plant distinctly glaucous; annual .... *Tecticornia australasica*
7. Plant not distinctly glaucous; perennial .... *Halosarcia* spp.

8. Leaves compound 9
8. Leaves simple 12

9. Trees 10
9. Climbers or scramblers 11

10. Leaflet apex consistently emarginate .... *Cynometra iripa*
10. Leaflet apex acute to obtuse, rarely emarginate .... *Xylocarpus* spp.

11. Leaf with 3-5 leaflets .... *Derris trifoliata*
11. Leaf with more than 7 leaflets .... *Dalbergia candenatensis*

12. Leaves opposite 13
12. Leaves otherwise arranged 22

13. Plant scrambling climbing or prostrate, stems lax 14
13. Plant a shrub or tree; stems erect 15

14. Leaves fleshy; plant prostrate .... *Sesuvium portulacastrum*
14. Leaves not fleshy; plant scrambling .... *Acanthus* spp.
14. Leaves either; plant climbing .... *Cynanchum carnosum*

15. Leaves gland dotted; odorous when crushed. .... *Osbornia octodonta*
15. Not as above 16

16. New growth strongly resinous .... *Scyphiphora hydrophylacea*
16. Not as above 17

17. Leaves small, < 3.0 cm long, pubescent .... *Pemphis acidula*
17. Leaves larger, > 3.5 cm long, glabrous 18

18. Pneumatophores conical (pencil-like) 19
18. Pneumatophores knee like or arching or absent 20

19. Small glands at base of petiole; stamens numerous, white; fruit woody, many seeded .... *Sonneratia* spp.

19. Small glands lacking; stamens few, yellow; fruit fleshy, one seeded .... *Avicennia* spp.

20. Trees supported by conspicuous arching stilt roots; calyx 4-lobed; petals entire .... *Rhizophora* spp.

20. Trees and shrubs lacking stilt roots; calyx 5-16 lobed; petals fringed or lobed 21

21. Trees and large shrubs; knee roots often present; calyx 8-16-lobed; petals bifid or emarginate .... *Bruguiera* spp.

21. Shrubs or small trees; knee roots absent; calyx 5-16-lobed; petals fringed or 3-lobed .... *Ceriops* spp.

22. White latex present; inflorescence a catkin; fruit distinctly 3 lobed .... *Excoecaria* spp.

22. White latex absent; inflorescence and fruit not as above ... 23

23. Petiole sheathing stem .... *Aegialitis annulata*

23. Petiole not sheathing stem 24

24. Leaves broadly elliptic or orbicular, > 6cm wide 25

24. Leaves elliptic, < 5 cm wide 26

25. Leaves discolorous; stellate hairs present; nectaries at base of main veins below leaf .... *Hibiscus tiliaceus*

25. Leaves conclorous; rusty scales present; rounded domatia in axils of main veins below leaf .... *Thespesia populneoides*

26. Leaves glabrous 27

26. Leaves (especially new growth) bearing pale or brown, minute scales .... *Camptostemon schultzii*

27. Leaf base gradually tapering, petiole indistinct; leaf apex bearing small gland .... *Lumnitzera* spp.

27. Petiole distinct; leaf apex lacking gland 28

28. Fruit oval or globular, apex blunt .... *Diospyros* spp.

28. Fruit corniculate (horn shaped), apex sharply pointed .... *Aegiceras corniculatum*

KEY 2

1. Leaves simple, opposite 2
1. Leaves simple, alternate 14
1. Leaves compound 22
1. Leaves grasslike 27
1. Leaves reduced (apparently absent) 28

2. Leaves superfluous, succulent 3
2. Leaves not superfluous or succulent 4

3. Leaves flattened, elliptic .... *Cynanchum carnosum*
3. Leaves flattened, straplike, 25-70mm long .... *Sesuvium portulacastrum*
3. Leaves rounded, 5-15mm long .... *Batis argillicola*

4. Leaves densely gland dotted .... *Osbornia octodonta*
4. Leaves without gland dots 5

5. Fruit viviparous 6
5. Fruit not viviparous 7

6. Calyx 4-lobed; petals entire .... *Rhizophora* spp.
6. Calyx 8-16-lobed; petals bilobed .... *Bruguiera* spp.
6. Calyx 5-16-lobed; petals trilobed or fringed .... *Ceriops* spp.

7. Anthers many, long, white, conspicuous .... *Sonneratia* spp.
7. Anthers not as above 8

8. Calyx 4- or 5-lobed 9
8. Calyx 6-lobed or entire 12

9. Calyx 4-lobed 10
9. Calyx 5-lobed 11

10. Corolla blue or purple; new growth not resinous .... *Acanthus* spp.
10. Corolla white; new growth resinous .... *Scyphiphora hydrophylacea*

11. Capsule compressed-ovoid, 2cm long, 1 seeded. .... *Avicennia* spp.
11. Follicle acuminate, 7.5cm long, many seeded. .... *Cynanchum carnosum*

12. Calyx entire .... *Amyema* spp.
12. Calyx 6-lobed 13

13. Leaves glabrous, aerial parasite .... *Lysiana maritima*
13. Leaves shortly hairy; shrub or tree .... *Pemphis acidula*

14. Latex white copious .... *Excoecaria* spp.
14. Latex clear, not abundant 15

15. Petiole sheathing stem .... *Aegialitis annulata*
15. Petiole not sheathing stem 16

16. Leaves succulent .... *Suaeda arbusculoides*
16. Leaves not succulent 17

17. Leaves orbicular or deltoid, > 6cm wide 18
17. Leaves elliptic, <5cm wide 19

18. Leaves concolorous; hairs as small, rusty scales .... *Thespesia populneoides*
18. Leaves discolorous; hairs stellate .... *Hibiscus tiliaceus*

19. Leaves (especially new growth) bearing pale or brown minute scales .... *Camptostemon schutzii*
19. Leaves glabrous 20

20. Petiole indistinct; inconspicuous gland at leaf apex .... *Lumnitzera* spp.
20. Petiole distinct; gland absent 21

21. Fruit ovate or globular, blunt .... *Diospyros* spp.
21. Fruit corniculate (horn shaped), pointed .... *Aegiceras corniculatum*

22. Leaflets > 10 per leaf; leaf > 1m long 23
22. Leaflets 3-7 per leaf; leaf < 30cm long. 24

23. Palm;, pinnae 30-6- cm long .... *Nypa fruticans*
23. Fern; pinnae 10-20 cm long .... *Acrostichum speciosum*

24. Leaves imparipinnate, leaflet number odd 25
24. Leaves paripinnate, leaflet number even 26

25. Leaflets 3 or 5 per leaf..*Derris trifoliata*
25. Leaflets 7 or 9 per leaf..*Dalbergia candenatensis*

26. Leaflet apex consistently emarginate;
pod wrinkled, beaked..*Cynometra iripa*
26. Leaflet apex acute to obtuse, occasionally emarginate;
capsule almost spherical, smooth ....*Xylocarpus* spp.

27. Stems above ground; inflorescence 3-4 armed....................*Cynodon dactylon*
27. Stems below ground; inflorescence spike like ....*Sporobolus virginicus*

28. Articles of stem 5-10mm long, green or pale green ....*Halosarcia* spp.
28. Articles of stem 7-15mm long, bluish-green.......................*Tecticornia australasica*

MANGROVE DESCRIPTIONS: The following descriptions are arranged alphabetically by genus and species. They are presented in a flora style format which is effectively self explanatory.

All descriptions and illustrations are based upon material from the Northern Territory, with the exception of *Cynometra iripa* and *Dalbergia candenatensis*. These were drawn from specimens collected from Queensland as no fertile material from the Northern Territory was available at the time of illustration.

ACANTHUS L. ACANTHACEAE

DERIVATION: The Greek "acanthus" (thorny) refers to the spiny leaves of some species.

A genus of 8-10 species worldwide, three are mangroves; two occur in tidal areas of the N.T.

Subshrubs, stems decumbent, forming thickets. Leaves decussate, petiolate, glabrous. Inflorescence a terminal spike. Calyx 4-lobed, outer pair ovate, 12-15 mm long, blunt; inner pair narrowly ovate, 8-11 mm long, acute. Corolla tube 6-8 mm long; upper lip lacking; lower lip orbicular, 18-23 x 16-19 mm, apex 3 lobed, inner surface shortly pubescent. Stamens 4, inserted at apex of corolla tube in pairs; filaments to 12 mm long; anthers 6 mm long, 1-celled, margin bearded. Ovary superior, 2-locular, 2 ovules per locule; style slender; stigma obscurely 2-lobed. Capsule ovoid to oblong, 18-25 mm long, dark brown, shining when mature. Seeds 2-4, borne on strong hooks, discoid, 7-10 mm diam., surface rugose with tomentum of short hairs.

KEY TO SPECIES:

1. Flowers subtended by 1 bract only; corolla rich purple .... *A. ebracteatus*
1. Flowers subtended by 1 bract and 2 bracteoles; corolla pale lilac .... *A. ilicifolius*

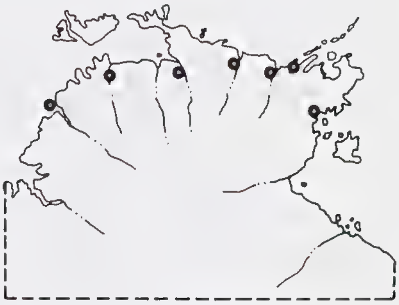
Acanthus ebracteatus Vahl.

DERIVATION: The Latin "ebracteatus" (lacking bracts) refers to the lack of bracteoles in this species.

Subshrub forming loose thickets to 2.0 m. Leaf lamina narrowly ovate, 7.5-16.5 x 2.5-5.5 cm, apex acute, base cuneate, margins generally entire, petiole 4-19 mm; axillary spines absent. Bract 1, broadly ovate, 6 x 6 mm, blunt; bracteoles absent. Corolla rich purple. Abaxial stamens lacking sessile glands on dorsal surface. Style 16-17 mm long.

HABITAT: A. ebracteatus prefers fine grained soils in upper tidal situations along tidal waterways and at the landward margin of mangal formations. This species may occur with *A. ilicifolius.*

DISTRIBUTION: *A. ebracteatus* occurs sporadically on the northern coastline, other Australian records include one collection from Western Australia and two collections from Queensland. Extra Australian distribution includes New Giunea, the Philippines and the Solomon Islands.



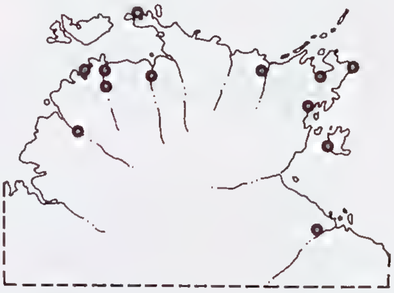
Acanthus ilicifolius L.

DERIVATION: The Greek "ilici" (Ilex) and "folius" (leaves) refer to the *Ilex* (holly) like leaves of this species.

Subshrub forming dense thickets to 1.5 m high, occasionally supported to 3.0 m; stilt roots present in larger specimens. Leaf lamina narrowly ovate, 5-15 x 2-6 cm, base cuneate, apex acute to aristate, margin entire to sinuate, spiny; petiole 0.8-1.3 cm; axillary spines to 5 mm, occasionally absent. Bract 1, ovate, 6-8 mm long, apex acute to acuminate; bracteoles 2, asymmetric, ovate, 6-7 mm long, apex acute. Corolla pale lilac to almost white in older specimens. Abaxial stamens bearing sessile glands on dorsal surface. Style 15-18 mm long.

HABITAT: *A. ilicifolius* forms thickets along tidal waterways and the landward margin of mangrove zones, particularly in areas that receive some freshwater input. Wells (1982) records this species as growing in hypersaline areas also. Substrates colonised are generally fine grained muds. Common associates include *Avicennia marina, A. integra* and *Aegiceras corniculatum.*

DISTRIBUTION: *A. ilicifolius* is sporadically distributed across the N.T. coast, and also occurs in Queensland. Extra Australian records include India, Malesia, the Solomon Islands and New Caledonia.



NOTES: Differentiation of these two species on vegetative characters is at best hazardous. *A ilicifolius* frequently exhibits entire leaves, expecially in conditions of low sunlight or strong growth, occasionally axillary spines are also lacking. *A. ebracteatus* may possess dentate, toothed foliage, though no specimens observed in N.T. populations have possessed axillary spines. However the two species can be unequivocally differentiated via floral characters, i.e. *A. ilicifolius*, in the known N.T. populations, possesses a) one bract and two bracteoles subtending the flower; b) corolla color from pale lilac to almost white; c) sessile glands on dorsal surface of abaxial stamens. In contrast *A. ebracteatus* possesses a) one bract only subtending flower; b) corolla color rich purple; c) no sessile glands on dorsal surface of abaxial stamens.

Floral morphology of *Acanthus* spp. dictates a large pollinator. Primack *et al.*(1981) observed Sunbirds (*Nectarina jugularis*) visiting flowers of *Acanthus* spp. and suspected large *Xylocopa* bees of also pollinating flowers. The flowers of both species exhibit weak protandry which would resrict self pollination. Abundant fruit set within populations suggests that pollination is normally effective (Tomlinson 1986). Seed of *Acanthus* spp. is actively discharged fron the capsule via elastic funicles or jaculators (van der Pijl 1969). The short tomentum of interlocked hairs covering the seed traps air to aid bouyancy during water dispersal. *A. ilicifolius* flowers from May to November and fruits from June to December. *A. ebracteatus* flowers and fruits from September to February.

A. ilicifolius has been used to combat boils, rheumatism, blood impurities, snake bite and arrow poisoning in Malaysia (Watson 1928). In New Guinea a root and leaf mixture is used as hair restorer (Percival and Womersley 1975).

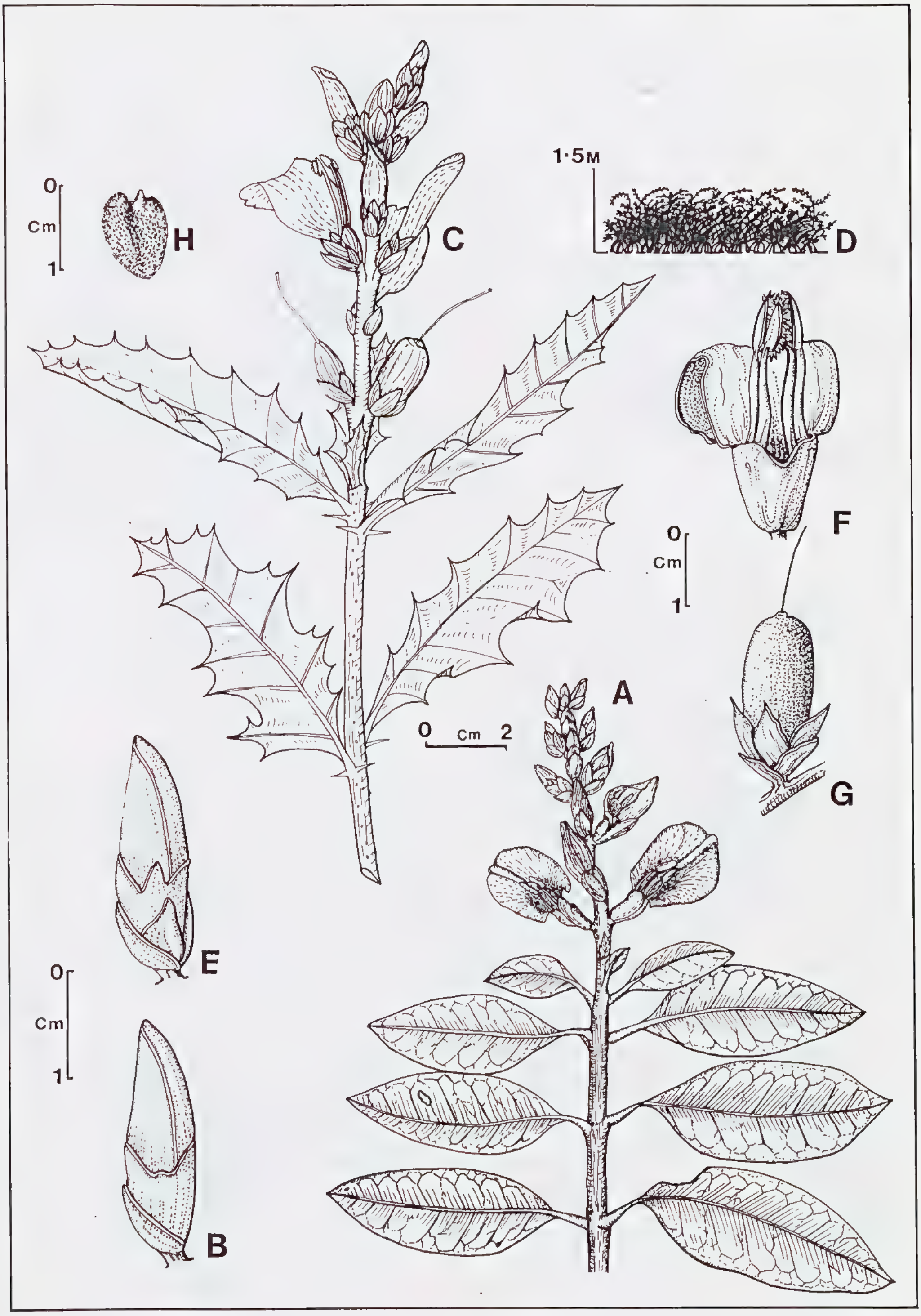


Figure 6. ***Acanthus***. A-B, *A. ebracteatus*. A, flowering branchlet; B, bud (A-B, G. Wightman 2450, DNA). C-H, *A. ilicifolius*. C, flowering and fruiting branchlet; D, habit; E, bud; F, flower; G, fruit; H, seed (E-F, G. Wightman 384, DNA; G-H, G. Wightman 950, DNA).

All records of *A. ilicifolius* from the N.T. are referrable to subspecies *orientalis* Brem. This subspecies, as the epithet suggests, has a more easterly distribution than the typical subspecies. Whilst ranges of these subspecies overlap, no intermediates are known (Bremekamp 1955). Similarly all specimens of *A. ebracteatus* are referrable to subspecies *ebarbatus* R.M. Barker, this subspecies is endemic to Australia and its range does not overlap with the typical subspecies (Barker 1986).

References: Barker 1986, Bremekamp 1955, Primack *et al.* 1981.

ACROSTICHUM L. PTERIDACEAE

DERIVATION: The Greek "acros" (end) and "stichos" (row) allude to the fertile apical pinnae.

A genus of about five tropical species, two occur in the N.T.; *A. speciosum* regularly occurs in tidal environments.

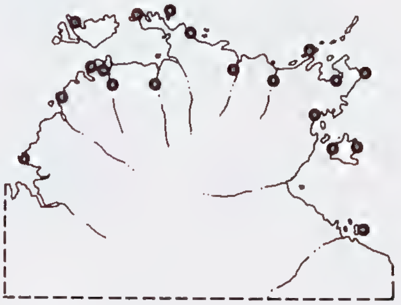
Acrostichum speciosum Willd.

DERIVATION: The Greek "speciosa" means showy, application uncertain.

Perennial fern forming coarse clumps to 1.5 m high; rootstock thick, bearing buttress-like roots; scale on ryizome lanceolate, border hyaline, 8 mm wide; stipule tufted, cartilaginous. Fronds pinnate, 1-3 m long; terminal pinnae conform; lateral pinnae oblong-lanceolate 10-20 x 2-3 cm, entire, apex acute-acuminate, venation anastromosing, coriaceous, dark green. Fertile pinnae rusty coloured, smaller than sterile pinnae, lower surface covered with sporangia mixed with capitate paraphyses. Spores tetrahedral, clear-translucent.

HABITAT: *A. speciosum* often forms colonies along landward margins of tidal areas, particularly in areas with perennial freshwater input, e.g., monsoon forest - tidal forest ecotone. Soils include sands, muds and organic rich loams. Common associates are *Lumnitzera racemosa, Avicennia marina, Bruguiera gymnorrhiza, Dalbergia candenatensis* and *Diospyros compacta.*

DISTRIBUTION: *A. speciosum* is widespread, but uncommon across the N.T. coastline, this species also occurs in Western Australia, Queensland and New South Wales. Extra Australian distribution incorporates most of south east Asia.



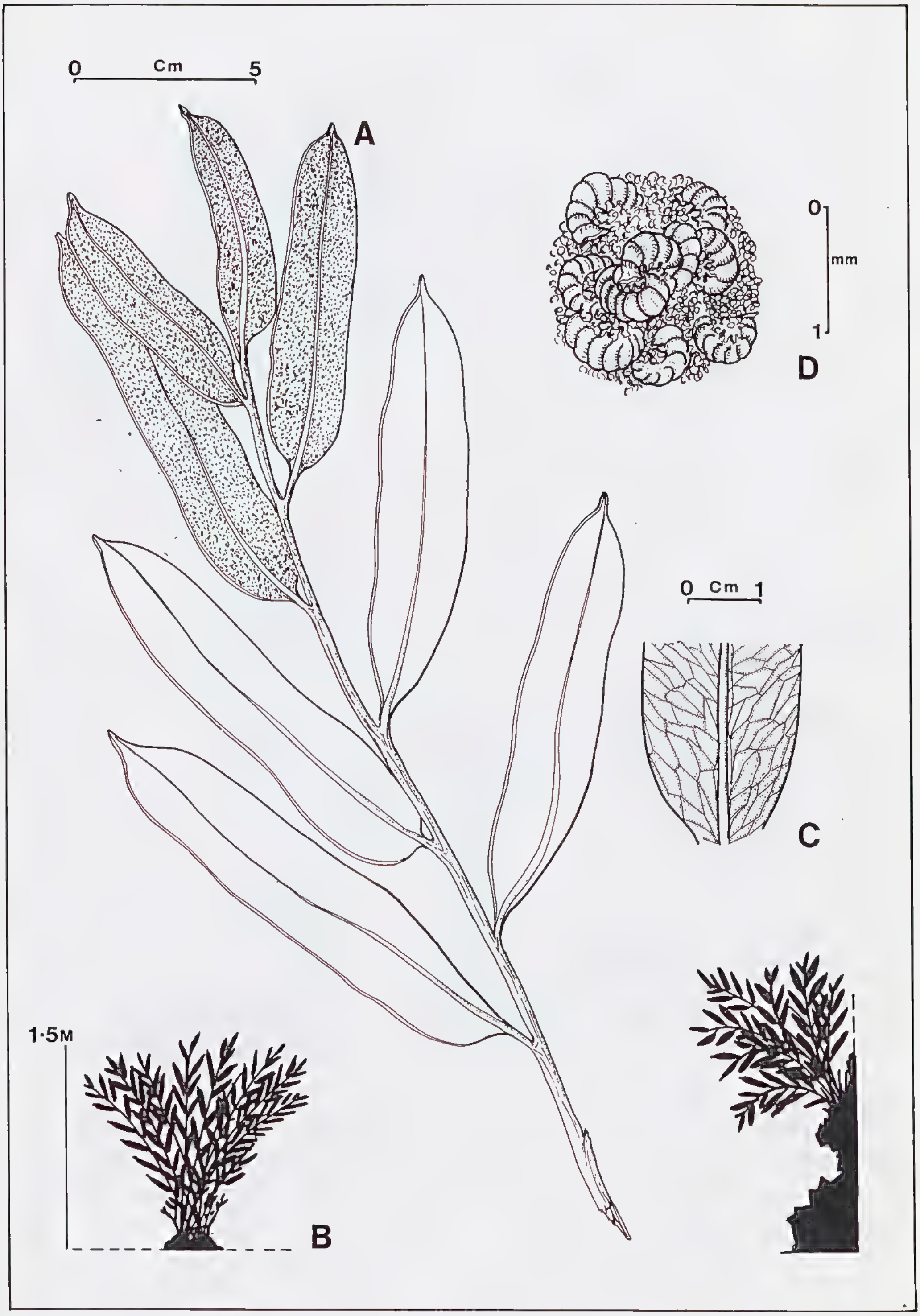


Figure 7. ***Acrostichum speciosum***. A, part of frond showing fertile pinnae; B, habit; C, pinnae venation; D, spores and indusia (A-D, B. Laing, s.n., DNA 7118).

NOTES: *A. speciosum* is distinguished by its acute to acuminate leaf apices, in contrast with the blunt apices characteristic of *A. aureum*, which also occurs in the N.T.

Fertile fronds are produced from August to April. Sporelings are copious from January to april, the majority of which perish during the dry season (April - November).

Watson (1928) notes Malayans using the fronds as high quality thatch.

AEGIALITIS R. Br. PLUMBAGINACEAE

DERIVATION: The Greek "aigialos" (seashore), refers to the habitat occupied by this genus.

A genus of two mangrove species of vicariant distribution; *A. annulata* occurs in N.T. tidal areas.

Aegialitis annulata R. Br.

DERIVATION: The Latin "annulatus" (marked with rings) refers to the conspicuous leaf scars on the twigs.

Slender shrub to 1.5 m, occasionally to 3.0 m; cryptoviviparous; stem base swollen, leaf scars conspicuous on twigs. Leaves alternate, petiole 5.5 cm, winged and sheathing stem; lamina broadly ovate, 6-8 x 4.5-6 cm, marked by longitudinal depressions and salt glands, apex obtuse, base cuneate-truncate. Panicle dichotomous. Flowers solitary, shortly pedicellate with sheathing, folded bract, 8 x 6 mm, enclosing 2 smaller bracteoles. Calyx tubular, 8 mm long, composed of 5 prominent, induplicate ribs ending in toothed lobes. Corolla tube to 2 mm long, above this 4 elongate-spathulate, convulate lobes to 8mm long. Stamens 5; filaments 4 mm long, base flattened, epipetalous; anthers 2 mm long. Ovary superior, unilocular, ovules one; styles 5, 6 mm long; stigmas capitate. Capsule falcate, 5-angled, 2 x 50 mm, dull crimson when mature. Seed 48 x 2.0 mm.

HABIT: *A. annulata* is restricted to areas inundated by waters with salinity at least that of seawater (at the end of dry season). Soils from mud to rock are colonised. *A. annulata* is commonly found at the seaward edge of mangals in association with *Avicennia marina* and *Sonneratia alba;* exposed positions are preferred.

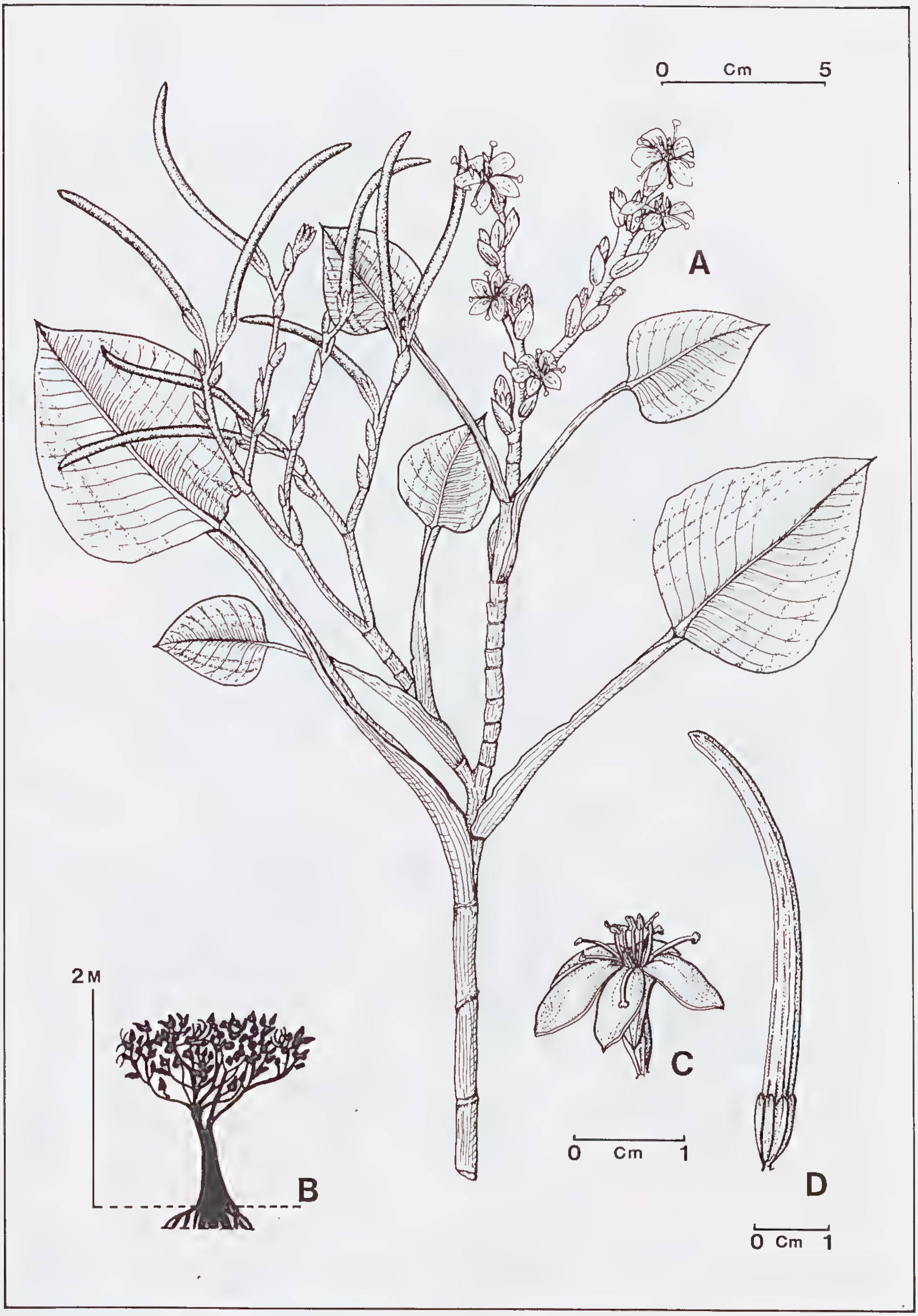
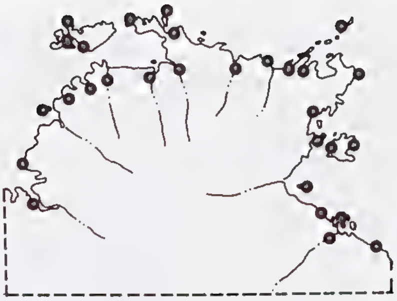


Figure 8. ***Aegialitis annulata***. A, flowering and fruiting branch; B, habit; C, flower; D, fruit (A, G. Wightman 980, DNA; C, G. Wightman 700, DNA; D, G. Wells s.n., DNA 12297).



DISTRIBUTION: *A. annulata* is widespread and common across the entire N.T. coastline. This species also occurs in Western Australia and Queensland. Extra Australian occurrences include New Guinea, the Moluccas and Lesser Sunda Islands.

NOTES: The genus *Aegialitis* consists of two morphologically and geographically distinct species, *A. annulata* and *A. rotundifolia*, however fossil pollen is known from the intermediate area (van Steenis 1949).

The small white flowers of *A. annulata* are regularly visited by ants, apparently as pollinators. Flowers are produced during the period September to November, mature fruit appear from January to March. Saenger (1982) describes the fruit as an indehiscent nut and uses the term cryptoviviparous to describe embryo enlargement within the fruit without rupturing the pericarp. The presence of spongy air filled tissue in the swollen mesocarp of the seed was interpreted by van Steenis (1949) as aiding bouyancy, thus enhancing water borne dispersal.

Levitt (1981) reports Aboriginal children from Groote Eylandt using *A. annulata* leaves as imaginary stingrays, which they pretend to spear and cook. Belyuen Aboriginals bend the leaves to use as a whistle (pers. obs.).

AEGICERAS Gaertner MYRSINACEAE

DERIVATION: The Greek "aix" (goat) and "keras" (horn) pertain to the fruits resemblance to a goats horn.

A genus of two species; *A. corniculatum* occurs in tropical Australia, including N.T. tidal areas.

Aegiceras corniculatum (L.) Blanco

DERIVATION: The Latin "corniculatus" (curved like a horn) refers to the curved fruit of this species.

Shrub or small tree to 5 m; viviparous; bark grey-brown. Leaves alternate, petiole 15 mm; lamina obovate-elliptic, 4-8 x 1.8-3.4 cm, discolorous; apex broadly obtuse, base cuneate. Inflorescence axillary and terminal umbels, peduncles short or absent, pedicel 9 mm. Flowers 5-partite. Sepals obtuse, 5 mm long, stiffly convulute. Corolla tube to 5 mm, throat tomentose, lobes reflexed, acute, 5 mm long. Stamens united into short tube clothed with glandular hairs, inserted on corolla

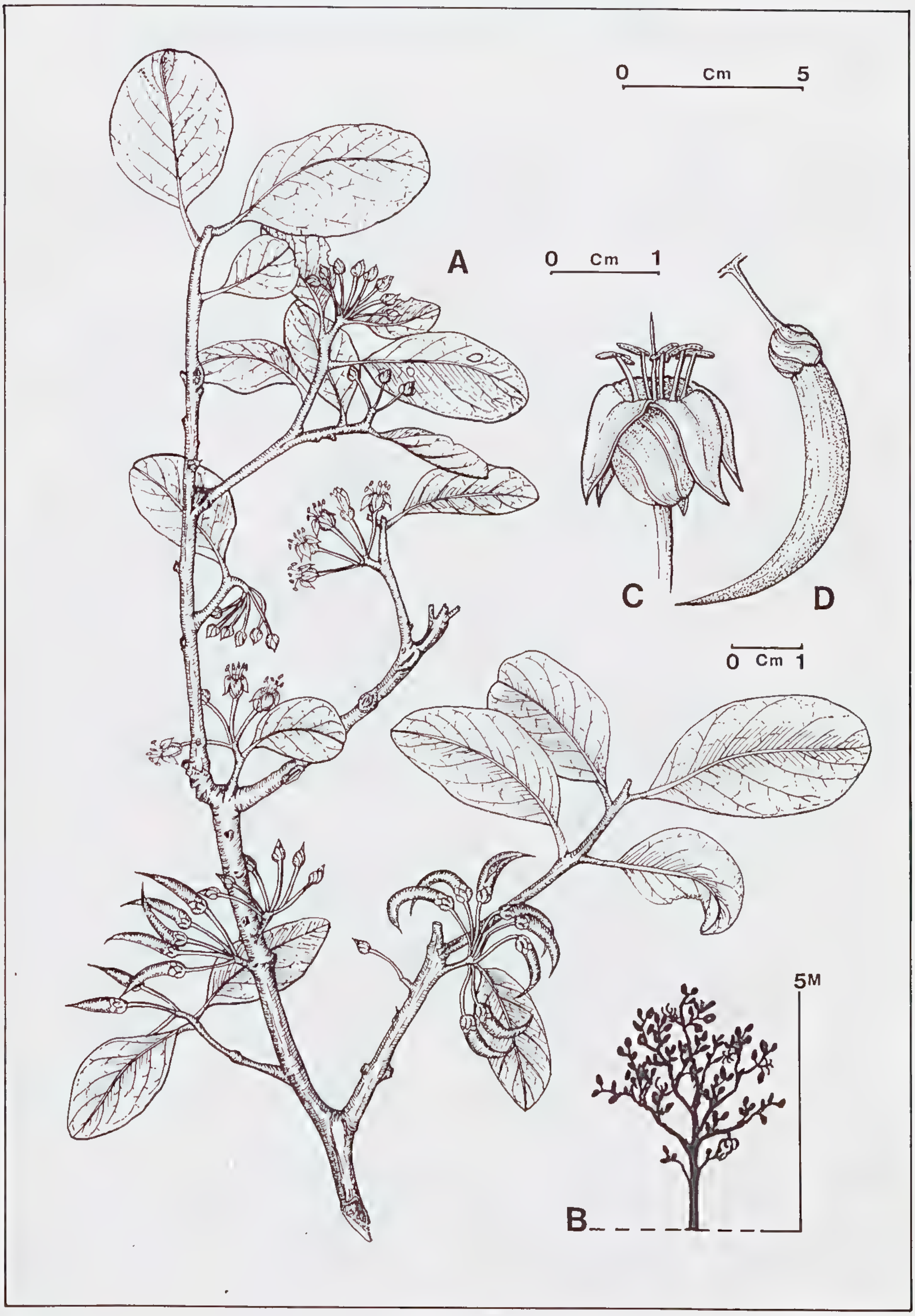
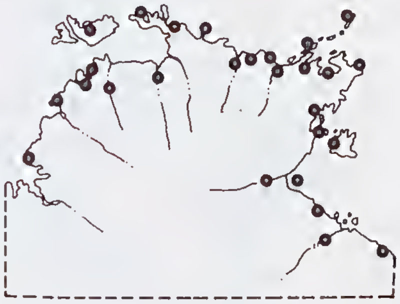


Figure 9. ***Aegiceras corniculatum***. A, flowering and fruiting branch; B, habit; C, flower; D, fruit (A, G. Wightman 2451, DNA; C, G. Wightman 3307, DNA; D, G. Wightman 2350, DNA).

tube; filaments 4 mm; anthers 3 mm, sagitate. Ovary superior, unilocular, ovule one; style 6 mm long, tapering from broad base, patterned with dark spots. Fruit cylindrical, curved, 38 x 6 mm, apex acute.

HABITAT: *A. corniculatum* is tolerant of a wide range of salinity, soil and light regimes, thus it is found in a variety of tidal environments. It most commonly occurs along the landward margins of coastal mangals and fringes of seasonally brackish waterways. Associates include *Avicennia marina, Camptostemon schultzii* and *Aegialitis annulata.*

DISTRIBUTION: *A. corniculatum* occurs commonly across the entire N.T. coast, extending its range to Western Australia and through Queensland to New South Wales. Extra Australian localities include New Guinea, India, Malaysia, Sri Lanka, Java and south China.



NOTES: *A. corniculatum* produces flowers during May-October, the sweet smell associated with the flowers suggests bee pollination. Fruits mature from December to March. Saenger (1982) considers seed development to be cryptoviviporous, a theory supported by Ding Hou (1958), who notes the embryo only pierces the pericarp after the fruit has fallen. The propagule is suited to water dispersal via its inherent bouyancy, Clarke and Hannon (1970) found that *A. corniculatum* fruit fall coincided with unusually high tides.

The use of *A. corniculatum* as a source of oyster stakes and salt has been reported (Cribb and Cribb 1981), a decoction of leaves is used as a remedy for earache by female (only) Aboriginals in Queensland (Lassak & McCarthy 1983). The light coloured, easily worked wood of *A. corniculatum* is used to build huts and as firewood in India (Maiden 1889).

AMYEMA Tiegh. LORANTHACEAE

DERIVATION: The Greek "amyema" refers to a genus previously not known.

A genus of c. 100 species; of the 36 Australian species 32 are endemic. Two of the Northern Territory native species are host specific to mangrove trees.

Aerial stem parasites, erect or spreading. Leaves opposite. Inflorescence an axillary pedunculate umbel of triads, central flower sessile, lateral flowers pedicellate, each flower subtended by a bract. Calyx entire. Corolla lobes free. Stamens epipetalous; anthers basifixed. Ovary inferior, locules obscure, sporogenous tissue massive; style slender; stigma small, simple. Fruit baccate, calyx persistent. Seed 1.

KEY TO SPECIES:

1.	Corolla 5-merous; rays 3-4; leaves elliptic	*A. mackayense*
1.	Corolla 4-merous; rays 2; leaves orbicular-obovate	*A. thalassium*

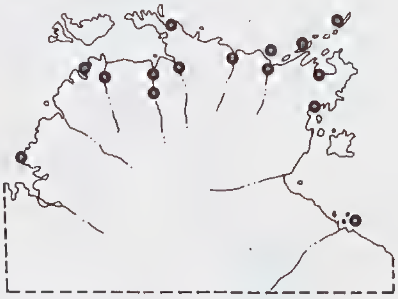
Amyema mackayense (Blakely) Danser

DERIVATION: The Latin "mackayense" refers to Mackay, Queensland, where the type specimen of this name was collected.

Leaf lamina 30-60 x 22-45 mm, apex rounded, base contracted to terete petiole. Peduncle deflexed, 6-15 mm long; rays 5-10 mm long; pedicels of lateral flowers 2-5 mm long; bracts 1 mm long, acute, apex with short bristles. Calyx 0.5 - 1.0 mm long. Corolla 15-18 mm long, red to yellow-green. Stamens 5; filaments 15-18 mm long, 5 mm free; anthers 2 mm long. Fruit ellipsoidal, 6 mm long.

HABITAT: *A. mackayense* has been recorded from the following hosts: *Rhizophora stylosa, Avicennia marina, Camptostemon schultzii* and *Aegiceras corniculatum.*

DISTRIBUTION: *A. mackayense* occurs sporadically across the N.T. coast. This species also occurs in Western Australia, Queensland and New Guinea.



Amyema thalassium Barlow.

DERIVATION: The Greek "thalassium" refers to a seaside habitat.

Leaf lamina 25-45 x 25-40 mm, apex blunt, base obtuse, petiole winged, 3-6 mm long. Peduncle 2-8 mm long; rays 5-10 mm long, angular or winged; pedicels of lateral flowers 4-8 mm long, angular or winged; bracts 1.5 mm long, concave. Calyx 0.7 mm long. Corolla strongly 4-winged, 18-20 mm long, base red, apex green. Stamens 4; filaments 18-20 mm long, 3 mm free; anther 3 mm long. Fruit funnel-shaped, 12 mm long.

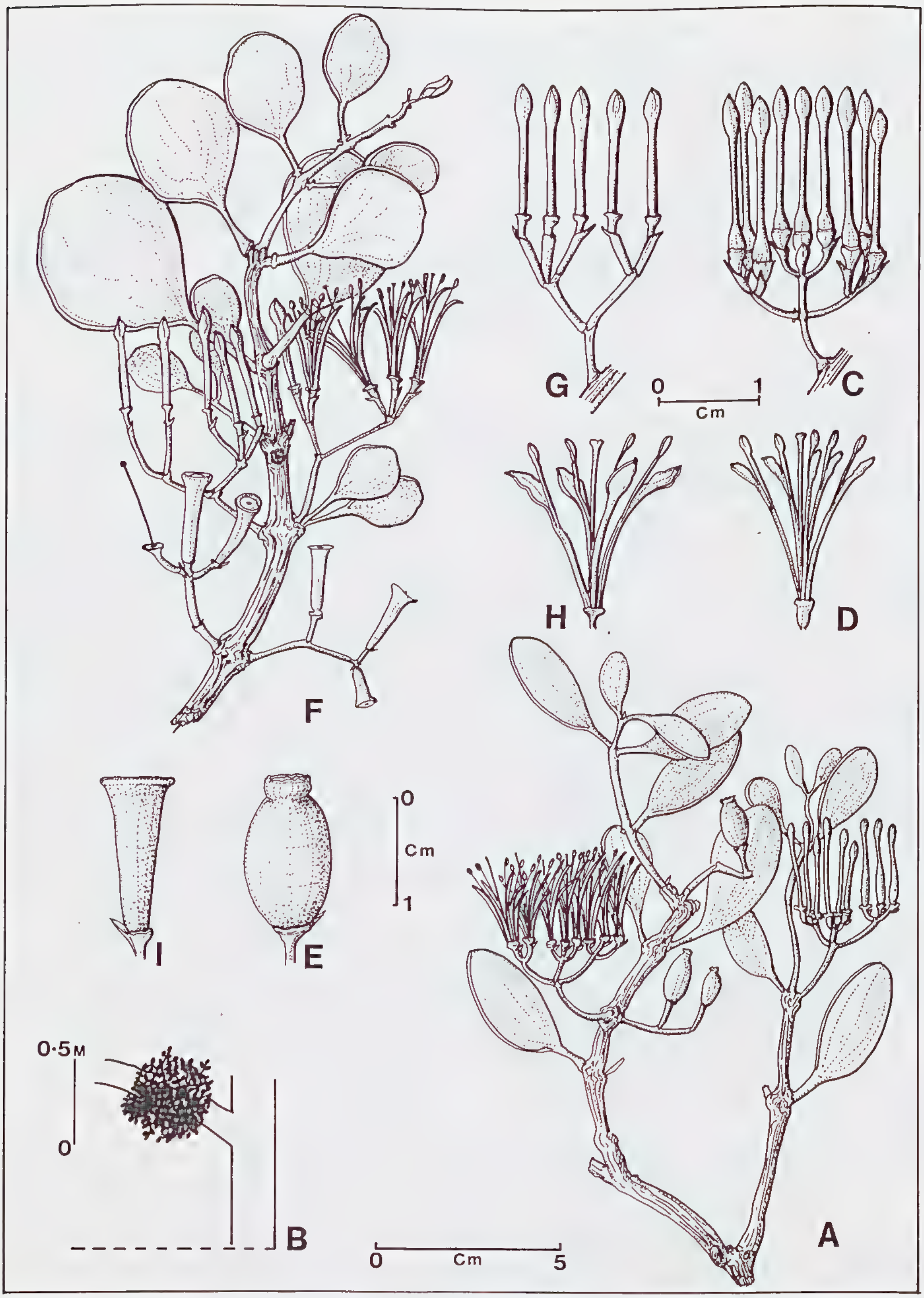
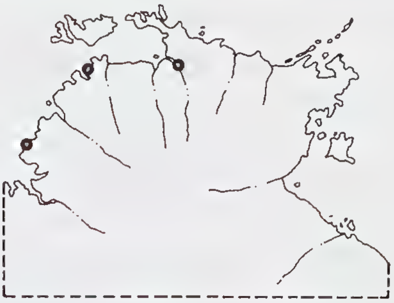


Figure 10. ***Amyema***. A-E, *A. mackayense*. A, flowering and fruiting branch; B, habit; C, inflorescence; D, flower; E, fruit (A-E, G. Wightman 713 & M. Parker 1818, DNA). F-I, *A. thalassium*. F, flowering and fruiting branch; G, inflorescence; H, flower; I, fruit (F-I, G. Wightman 1815 & M. Parker 319, DNA).

HABITAT: The recorded host in the Northern Territory is *Avicennia marina*, Barlow (1984) also records *Excoecaria* and *Bruguiera* as hosts.



DISTRIBUTION: *A. thalassium* is known from three areas in the N.T. *A.thalassium* also occurs inWestern Australia and Queensland and is an Australian endemic.

NOTES: All material of *A. mackayense* examined from N.T. populations is referrable to ssp. *cycnei-sinus* (Blakely) Barlow.

A. mackayense produces flowers and fruit throughout the year. The less common and poorly collected, *A. thalassium* has fertile records from January, February, May and September. The connection between dispersal of Mistletoes and the Mistletoebird (*Dicaeum hirundinaceum*), is well documented (Keast 1981, Liddy 1983). Suffice to say that Mistletoebirds are the primary distributors of these species. The seeds are voided within 25 minutes of being eaten, the sticky seeds adhere to the branches of prospective hosts and germinate. The partially red petals of both species attract birds as pollinators.

For names previously used for these taxa refer to Barlow 1984.

References: Barlow 1966, 1984.

AVICENNIA L. VERBENACEAE

DERIVATION: In honour of celebrated Arabian physician and philosopher aub-Ali-al-Husayn ibn-Sina (or Avicennia) 980-1037AD.

A genus of about 11 species worldwide, two occur in Australia, both are known from N.T. tidal areas; *A. integra* is endemic to the N.T.

Shrubs or trees; cryptoviviparous. Leaves simple, decussate, entire, petiolate, discolorous. Inflorescence cymose, terminal. Flowers sessile, subtended by 1 bract and 2 bracteoles. Calyx lobes 5, quincunialis. Corolla shortly tubular. Stamens epipetalous, inserted at apex of corolla tube. Ovary superior, unilocular, ovules 4, colaterally suspended on central placenta, upper ovary and style with short glandular tomentum. Capsule compressed-ovoid, fleshy, bracts and calyx persistent; dehiscing via dorsal suture. Seed solitary, embryo with 2 large cotyledons.

KEY TO SPECIES:

1. Leaf apex blunt; bark brown; flower 6-8 mm diameter .... *A. integra*
1. Leaf apex acuminate; bark greenish; flower 3-4 mm diameter .... *A. marina*

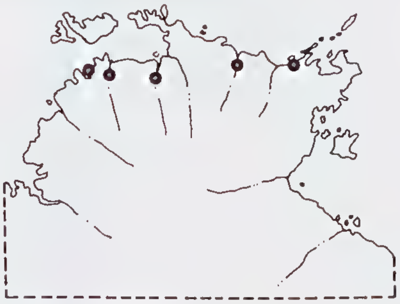
Avicennia integra N.C. Duke

DERIVATION: The Latin "integra" refers to the entire margins of the calyx and bracts of this species, unique within the genus *Avicennia.*

Shrub or tree to 6 m; bark brown, smooth; aerial roots copious from stem base; pneumatophores conical, pencil-like. Leaf lamina elliptic, 5.6-14.7 x 2.1-6.0 cm, apex blunt, base cuneate; petiole 1.0-3.1 cm. Inflorescence terminal, cymose; peduncles stout, 3 mm wide; bract entire, orbicular, 8 x 7 mm, shallowly 3-lobed; bracteoles entire, broadly elliptic, 7 x 6 mm, blunt. Corolla tube 3-4 mm long, lobes 5(6), broadly ovate, 6 x 5 mm, obtuse, exterior of lobes and upper tube shortly tomentose. Stamens 5; filaments 2-3 mm long; anthers 1.5 mm long, basifixed. Capsule 1.5 x 2.0 cm.

HABITAT: *A. integra* occurs on poorly consolidated muds along the margins of tidal rivers, particularly those that remain brackish for some time each year. Associates include *Sonneratia alba, Acanthus ilicifolius, Avicennia marina* and *Aegiceras corniculatum.*

DISTRIBUTION: *A. integra* is sporadically distributed across the northern coast and is endemic to the Northern Territory.

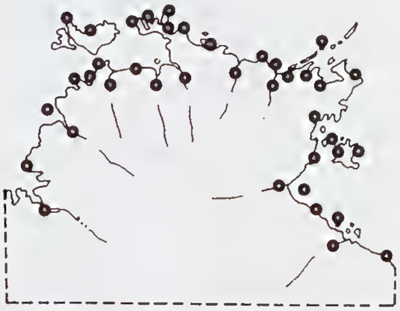


Avicennia marina (Forsskal) Vierh.

DERIVATION: The latin "mare" (sea) refers to the coastal habitat.

Shrub or tree to 15 m, erect or spreading; bark smooth, green-grey mottled; pneumatophores pencil-like, erect. Leaf lamina lanceolate to ovate, 5.4-11 x 1.8-3.5 cm, apex acuminate, base attenuate; petiole 1.2-2.5 cm. Peduncle rigid, angular, 1.5 mm wide; bract deltoid, 1 mm long, blunt; bracteoles deltoid, 0.7 mm long, blunt. Calyx lobes ovate, 2 mm long, blunt. Corolla tube 1.5 mm long; lobes 4(5), ovate, 1 mm long. blunt. Stamens 4(5), anthers sessile, 1 mm long. Style stout, 1.5 mm long; stigma inconspicuously 2-lobed. Capsule 1.5 x 2.0 cm.

HABITAT: Capable of colonising many tidal habitats, *A. marina* is one of the most ubiquitous members of the tidal flora. *A. marina* may be found in association with most other mangal species, on a variety of substrate types. It may also form monospecific stands. Wells (1981) notes A. marina withstanding salinities up to 83 ppt., and freshwater inundation of 1 m depth for up to 3 months of the year.



DISTRIBUTION: Widespread and common across the N.T. coastline, this species occurs in all Australian states except Tasmania. Extra Australian distribution encompasses Africa, Asia, South America and New Zealand.

NOTES: *A. marina* flowers from October to February, fruit appear from January to March. *A. integra* flowers from October to December and fruits in December and January. The small, dark orange flowers of *A. marina* produce a strong rotten fruit odor, which may be noticed some distance from the tree. *A integra* has larger, paler flowers which have a weak sweet scent. Both species produce nectar in reasonable quantities and bees and other small flying insects have been observed visiting *A. integra* flowers. Tomlinson (1986) notes a degree of protandry in *Avicennia* spp. which restricts self pollination. Fruit of both species are eaten by ants (*Polyrhachis sp.*). A narrow line of flesh along the dorsal suture is eaten, which may expedite unfolding of the cotyledons.

A. marina fruit is eaten by Aboriginals, but only after treatment to remove the bitter taste of the raw fruit (Cribb & Cribb 1981, Levitt 1981, Smith & Kalotas 1985). The leaves are also used to flavor mussels when they are cooked (Levitt 1981). Ash and bark are used by Aboriginals to treat skin disorders and stingray stings respectively (Anon. 1988). Native bees frequent this species in Florida to produce mangrove honey (Tomlinson 1986) while the ash produces a passable soap. Mangrove worms found in wood of this species are considered "no good" (Wightman & Smith 1989).

The taxonomy of *Avicennia* is confused, and is presently under study (Duke pers. com.). *Avicennia integra* has only recently been described as a new species (Duke 1988), previously it was confused with *A. officinalis*. The occurrence of this species is important for two reasons, firstly it is the only traditionally accepted mangrove species recognised to be endemic to Australia and secondly its distribution does not include the floristically rich area of north east Queensland (Duke 1988).

Avicennia marina has had a confused nomenclatural history, many workers applying varietal names to forms. As a taxonomic revision is in progress these subspecific taxa are for the present ignored.

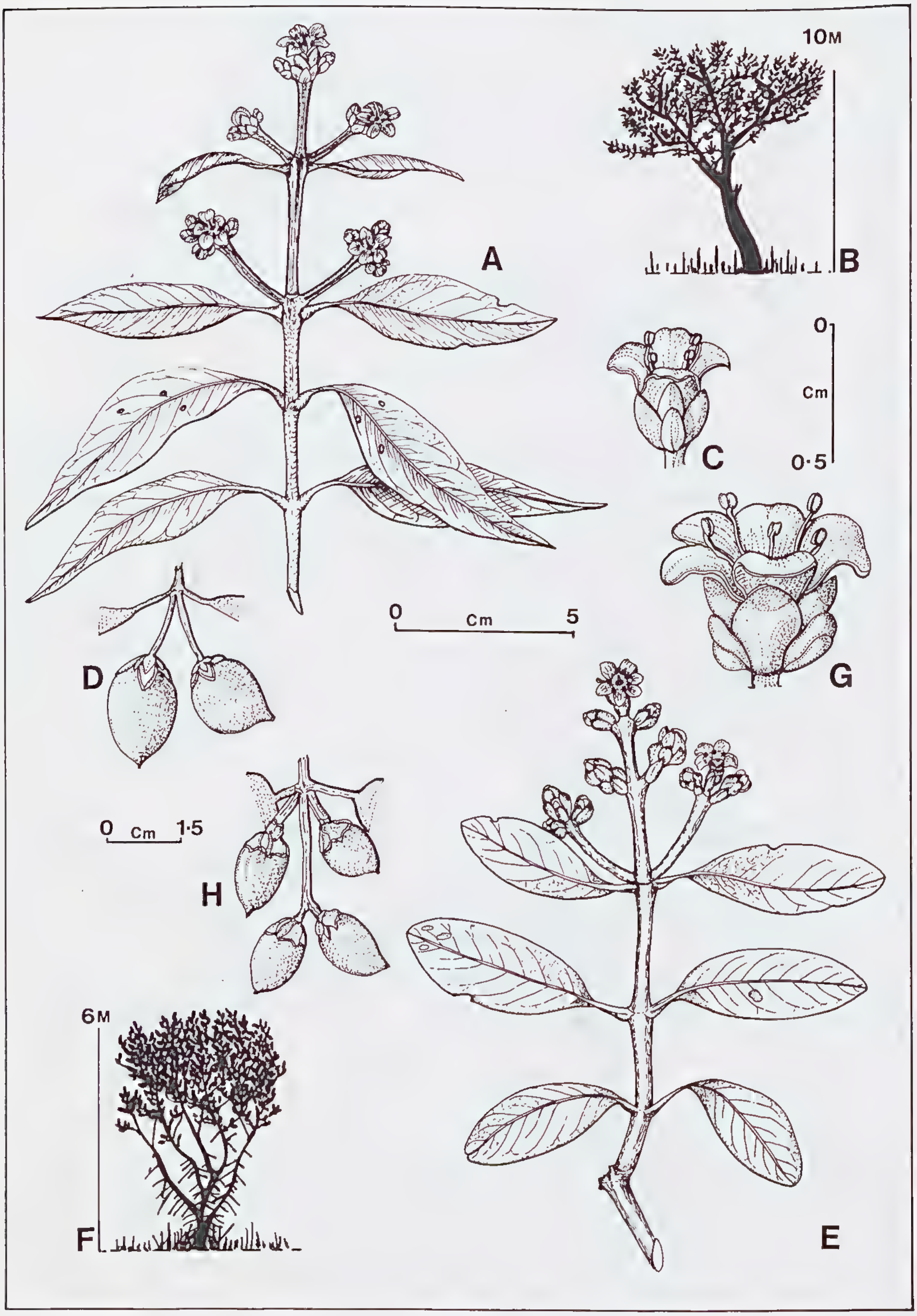


Figure 11. ***Avicennia***. A-D, *A. marina*. A, flowering branch; B, habit; C, flower; D, fruit (M. Parker 688 and G. Wightman 821, DNA). E-H, *A. integra*. E, flowering branch; F, habit; G, flower, H, fruit (G. Wightman 822 and G. Wightman 976, DNA).

DERIVATION: The Greek "batis" refers to an unidentified plant.

A genus of two species, one along the coast of tropical and sub-tropical America, the other, *B. argillicola* on the New Guinea and north Australian coasts.

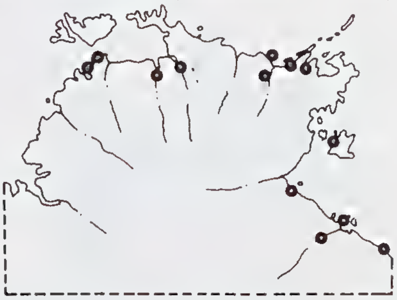
Batis argillicola Royen.

DERIVATION: The Latin "argillicola" (clay dwelling) refers to this species preference for clay soils.

Shrub, erect or rounded to 0.7 m; monoecious; base woody, bark fibrous, grey. Leaves opposite, simple, sessile, obovoid, 4-15 x 1-1.5 mm, rounded in cross-section, base saccate, apex blunt; stipules minute, caducous. Flowers sessile, axillary and terminal. Male flower subtended by 2 concave bracts, 4 x 2 mm and 2 united campanulate, bracteoles; stamens 4, alternating with staminodes; filaments linear, 2.5 mm long; anthers exserted, elliptic, 1 mm long; gynoecium rudimentary or absent. Female flower a naked ovary, ellipsoidal 4-7 x 1.5-3 mm, carpels 2, locules 4; stigma sessile, papillate. Drupe oblique, fleshy, 9-11 x 4-5 mm. Seeds oblong 5-5.5 x 1.2 mm.

HABITAT: *B. argillicola* occupies the landward zone of mangrove habitats, along the margins of tidal creeks or salt pans. Soils are generally saline muds, although sands may also be colonised. Common associates include *Avicennia marina, Lumnitzera racemosa, Halosarcia indica, Tecticornia australasica* and *Sporobolus virginicus.*

DISTRIBUTION: *B. argillicola* occurs sporadically on the N.T. coast. It also occurs in Western Australia, Queensland and New Guinea.



NOTES: Small inconspicuous flowers are produced from June to October, the inflated yellowish drupe (fruit) matures from December to February. The bouyant drupe is well adapted to water dispersal, the monoecious flowers are suited to insect pollination.

Ross (1982) notes differences between Australian and New Guinea material of *B. argillicola* in leaf, inflorescence and stamen characters. The spatial disjunction of the two members of the genus is of biogeographic interest.

References: Ross 1982, van Royen 1957.

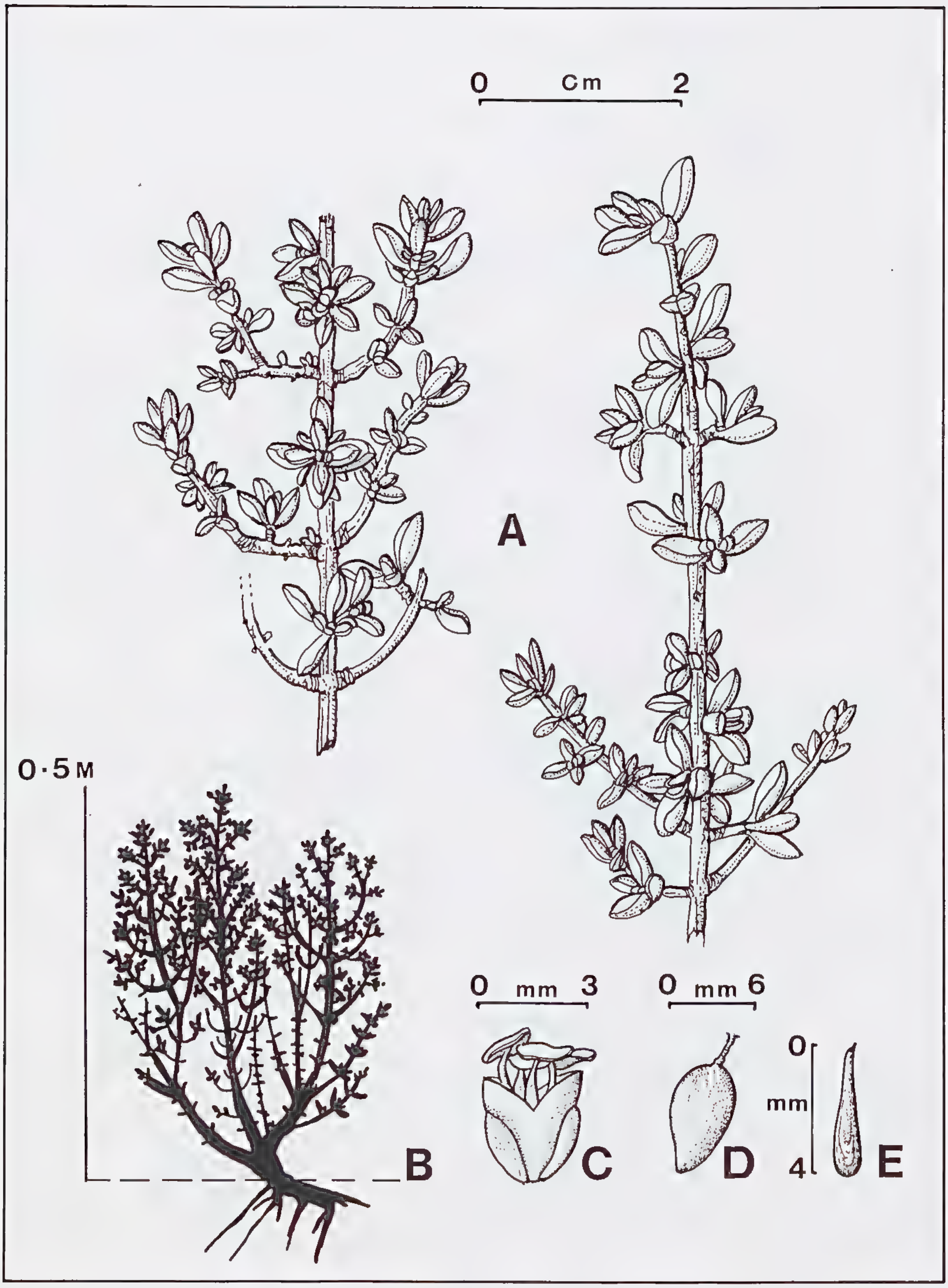


Figure 12. ***Batis agillicola***. A, branch; B, habit; C, flower; D, fruit; E, seed (G. Wightman 982 and G. Wightman 1816, DNA).

DERIVATION: In honor of French explorer J.G.Bruguieres, 1750-1799.

A genus of six species confined to the Indo-Pacific region, five occur in Australia, four in N.T. tidal forests. Believed to be reliant on freshwater input by some authors (Ding Hou 1958, McCusker 1984).

Large shrubs or trees; viviparous; base often buttressed, pnuematophores knee-like. Leaves decussate, simple, entire, glabrous, elliptic to broadly lanceolate, black dotted beneath; stipules lanceolate, 2-4 cm long. Inflorescences axillary, 1-10 flowered cymes; bracteoles absent. Sepals 8-16, free, persistent. Petals 8-16, each embracing a pair of stamens, 2 lobed with hairs and bristles, caducous. Stamens twice number of petals, paired, epipetalous; filaments filiform; anthers linear to oblong. Ovary inferior, 2-4 locular, ovules 2 per locule; style filiform; stigma obscurely lobed. Fruit baccate, indehiscent, 1 seeded. Hypocotyl terete or slightly ridged, blunt, falling with fruit.

KEY TO SPECIES:

1. Inflorescence 2-10-flowered; bristle in sinus of petal lobes far exceeds lobes .... *B. parviflora*
1. Inflorescence 1 flowered; bristle in sinus of petal lobes not exceeding lobes 2

2. Pedicel red; hypanthium red, indistinctly ribbed .... *B. gymnorrhiza*
2. Pedicel green; hypanthium green, distinctly ribbed 3

3. Bristle in sinus of petal lobes distinct; apex of petal lobes glabrous .... *B. sexangula*
3. Bristle in sinus of petal lobes inconspicuous or absent; apex of petals somewhat hirsute .... *B. exaristata*

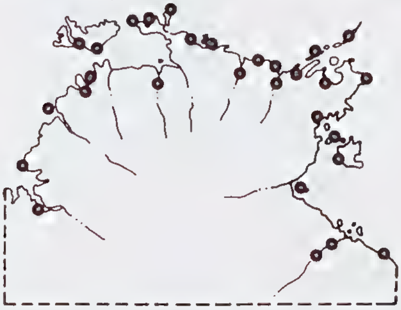
Bruguiera exaristata Ding Hou

DERIVATION: The Latin "exaristatus" (awnless) refers to the absence of a bristle between the petal lobes.

Shrub or tree to 8 m; bark dark grey, tessellate; stem base flanged, pneumatophores knee-like, copious. Leaf lamina obovate, 5.5-11.5 x 2.4-4.5 cm, margins often involute, base attenuate, apex acute; petiole 1.8-2.6 cm long; stipules lanceolate, 2.1-3.5 cm long. Mature bud 2.2-2.7 cm long; pedicel 6-12 mm, pendulous; hypanthium ridged. Sepals 8-9(-10), linear-lanceolate, 12-16 mm long, persistent. Petals 8-9(-10), 10-13 mm long, caducous, bilobed, lobes 5 mm long, margins and base villous, bristle in sinus absent or minute. Staminal filaments 8-9 mm long; anthers apiculate, 5 mm long. Style 14 mm long; stigma shortly 3-lobed. Fruit turbinate, 1.3-1.6 cm long. Hypocotyl cylindric, slightly ridged, 5-7.2 x 0.6-0.9 cm, apex blunt.

HABITAT: *B. exaristata* is commonly found fringing tidal waterways or toward the rear of coastal tidal forests. Associates include *Rhizophora stylosa*, *Avicennia marina*, *Camptostemon schultzii* and *Ceriops tagal*. Occasionally monospecific stands are formed. Suitable substrates include clay-loams, sands and gravels, and salinities up to 72 ppt. are tolerated (Wells 1981).

DISTRIBUTION: Common and widespread across the N.T. coastline, *B. exaristata* also occurs in Western Australia and Queensland. Extra Australian records include Timor and New Guinea.



NOTES: Bardi Aboriginals use the wood of *B. exaristata* for fishing boomerangs (Smith & Kalotas 1985). New Guineans manufacture an astringent cure for diarrhoea and dysentry from the fruit (Percival & Womersley 1975).

B. sexangula has been confused with this species in the past, see notes under that species.

B. exaristata produces flowers and fruit throughout the year, hypoocotyls are relatively small and easily dispersed by tide or flood. Seedlings appear to perish in low light intensities. The Red Headed honeyeater, *Myzomela erthrocephala*, has been observed visiting flowers of this species and is a likely pollinator (pers.obs.).

Bruguiera gymnorrhiza (L.) Lamk

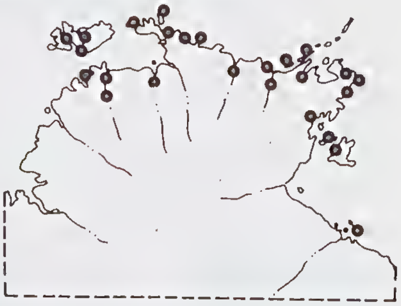
DERIVATION: From the Greek "gymno" (naked) and "rhiza" (root) referring to the exposed knee roots possessed by this species.

Columnar tree to 15 m; bark dark grey to brown, tessellate to smooth, lenticelled; stem base buttressed, knee roots copious. Leaf lamina elliptic to elliptic-lanceolate, 4.5-7.1 x 9.5-18.5 cm, coriaceous, apex acute, base attenuate; petiole 2.8-5.0 cm long; stipule 3.5-4.5 cm long, reddish. Mature bud 3.2-3.9 cm long; pedicel 10 mm long, pendulous, red; hypanthium distinctly reddish, terete or slightly ridged. Sepals 10-14(-16), linear, acute, 15-21 mm long, pink to red. Petals 10-

14(-16), 13-16 mm long, lobes 5-6 mm long with 2-3 bristles 3 mm long on apex, 1 conspicuous bristle in sinus, margins and base villous. Staminal filaments 9-11 mm long; anthers linear, mucronate, 4 mm long. Style 15-20 mm long; stigma 3-lobed. Fruit turbinate, terete, 2-2.5 cm long. Hypocotyl 12-20 x 1.5-2 cm, terete or slightly ridged, straight, blunt.

HABITAT: *B. gymnorrhiza* is frequently found in areas of low salinity at the rear of tidal forests and along tidal waterways that are brackish. Associates include most mangrove species. Substrates include mud, sand and occasionally black soils. Occasionally *B. gymnorrhiza* has been found growing at elevations above the tidal influence in riparian situations.

DISTRIBUTION: *B. gymnorrhiza* is common on the northern coast of the N.T. This species also occurs in Queensland and is widespread throughout the Indo-West Pacific region.



NOTES: Hypocotyls of *B. gymnorrhiza* have been used by north Queensland Aboriginals as a source of food, although preparation is required. Macassan fishermen used the bark of this species to produce a red dye, which was used to treat trepang on Groote Eylandt (Levitt 1981). In Molucca the treated hypocotyls are considered poor food, whilst in Indonesia a sweet meat of sugar and inner hypocotyl flesh is sold in markets. The hard, red timber is valued for firewood and ash production. Watson (1928) reports Malaysians using the fruit of this species as medicine for sore eyes, the pneumatophores as a source of scent and the bark as a condiment.

Mangrove species have been recorded growing above the influence of the tide in New Guinea (van Steenis 1984), the Christmas Islands (Woodroffe 1988) and West Australia (Beard 1967). In the Northern Territory *B. gymnorrhiza* exhibits similar habitat variability at Melville Island and Groote Eylandt, where it may be observed growing in atidal, nonsaline situations with typical riparian species.

Wells (1981) observes that seedlings of *B. gymnorrhiza* are capable of regenerating in areas of infrequent inundation. Occasional cyclonic surges that occur in coastal areas of the N.T. would allow propagules to be dispersed above normal tidal limits. *B. gymnorrhiza* is found in waters up to 37 ppt. Flowers and fruit are produced throughout the year. The relatively large flowers are pendulous, to allow easy bird pollination, the reddish calyx attracts the attention of pollinators. Propagules are suited to dispersal by tide and flood.

A single tree which appears to represent a hybrid between *B. gymnorrhiza* and *B. exaristata* is known from north east Arnhem Land (G. Wightman 4152, 4469, 4511, DNA). The hybrid status of this individual is supported by 1, intermediate and shared morphological characters of the putative parents; 2, reduced fertility (a single semi-mature fruit has been observed); 3,confused floral phenology and morphology; 4, luxuriant foliage growth; 5, low number of individuals. Both putative parents occur in the vicinity of the tree, which is situated in a rear mangal situation that receives fresh water run off well into the dry season.

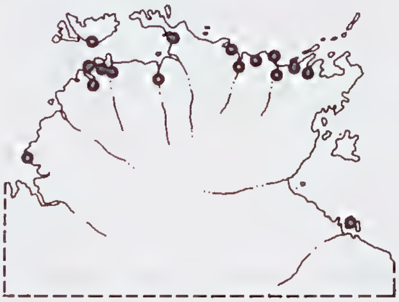
Bruguiera parviflora (Roxb.) Wight & Arn. ex Griffith

DERIVATION: The Latin "parvi" (small) and "flora" (flower) refer to the small flowers of this species.

Slender shrub or tree to 5(-8) m; bark grey, fissured; stem base slightly flanged, knee roots up to 30 cm high. Lamina elliptic, 5.5-10.5 x 1.8-3.9 cm, apex acute, base attenuate, margins often scalloped due to insect attack; petiole 10-20 mm long, stipules 21-40 mm long, lanceolate. Inflorescence 3-10 flowered; peduncle 5-10 mm long; pedicel 2-7 mm long; mature bud 6-10 mm long. Hypanthium 4-6 mm long, slightly ridged. Sepals 8, 2 mm long, narrowly triangular, apex acute with minute hook. Petals 8, 1.5-2 mm long, oblong, 3 bristles on each lobe, 1 bristle in sinus. Staminal filaments 1.5 mm long; anthers triangular, 0.5 mm long. Style 1.5 mm long; stigma 2-3 lobed. Fruit narrowly turbinate, 2 cm long. Hypocotyl cylindrical, smooth, curved, 8-15 x 0.4-0.6 cm.

HABITAT: *B. parviflora* typically forms monospecific stands in areas that are infrequently inundated, or occurs as isolated individuals in vegetation along tidal waterways. Associates include *B. exaristata, Rhizophora stylosa, Ceriops decandra, Camptostemon schultzii* and *Avicennia marina.* Suitable substrates include consolidated muds, sands and calcareous sands, brackish and hypersaline areas may be colonised.

DISTRIBUTION: Common on the northern coast of the N.T., this species also occurs in Western Australia and Queensland. Extra Australian records from Bangladesh to Vanuatu are reported.



NOTES: North Queensland Aboriginals produce paddles from the timber of *B. parviflora* (Roth 1901), while Malaysians use the timber for firewood.

The yellow-green flowers are produced from June to September, fruit appear from September to December. The light hypocotyls are easily dispersed in water, and prefer to establish in areas receiving high to moderate light (Wells 1981). The small flowers of this species are pollinated

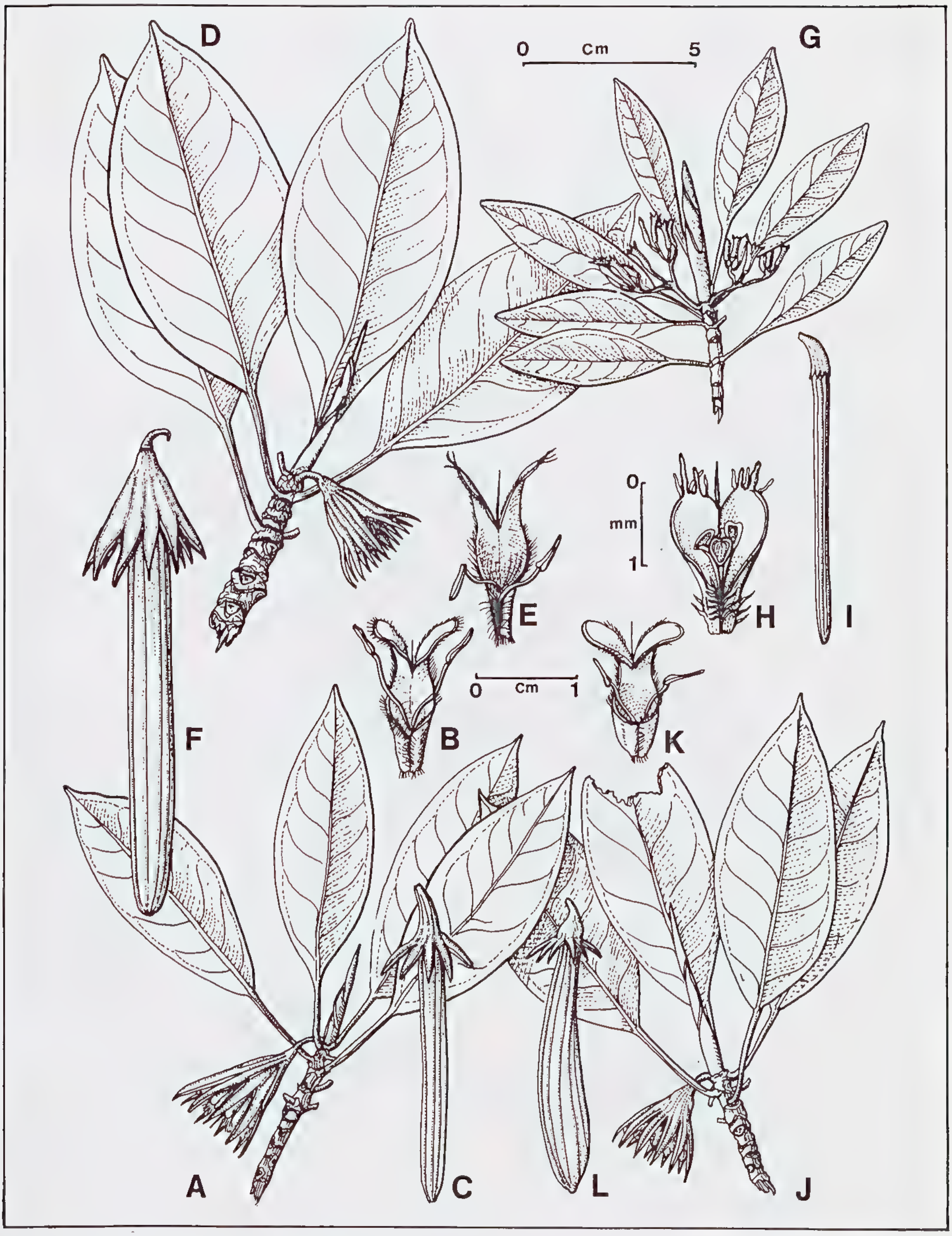


Figure 13. ***Bruguiera***. A-C, *B. exaristata*. A, flowering branch; B, petal; C, fruit and hypocotyl (A-C, G. Wightman 291 & G. Wightman 3233, DNA). D-F, *B. gymnorrhiza*. D, flowering branch; E, petal; F, fruit and hypocotyl (D-F, G. Wightman 440 & G. Wightman 617, DNA). G-I, *B. parviflora*. G, flowering branch; H, petal; I, fruit and hypocotyl (G-I, G. Wightman 501 & G. Wightman 519, DNA). J-L, *B. sexangula*. J, flowering branch; K, petal; L, fruit and hypocotyl (J-L, G. Wells s.n., DNA 15229).

by day flying insects such as butterflies, and unlike other members of this genus found in the N.T. the flowers are held erect.

The leaf margins of *B. parviflora* are often characteristically scalloped due to insect predation.

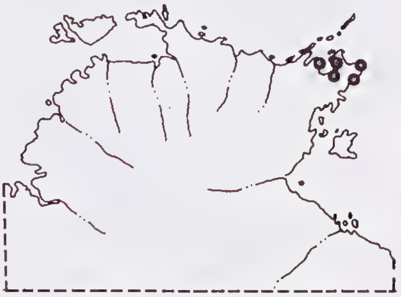
Bruguiera sexangula (Lour.) Poiret

DERIVATION: The Latin "sexangula" (six angled) refers to the six angled hypocotyl of this species.

Tree to 12 m; bark light brown to grey; stem base often flanged, knee roots present. Leaf lamina narrowly elliptic to elliptic, 9.5-11.5 x 3.0-4.1 cm, base attenuate, apex mucronate; petiole 6-12 mm long; stipule 4.0-4.2 cm long, lanceolate. Mature bud 2.7-3.1 cm long; pedicel 6-12 mm long; hypanthium ribbed. Sepals 10-11, lanceolate, 15-18 mm long, apex slightly recurved. Petals 10-11, 15 mm long, lobes 0.7 cm long, apex obtuse with 1 or 2 short bristles or glabrous, 1 bristle in sinus, margins and base pubescent. Staminal filaments 4-8 mm long; anthers linear, 4-5 mm long. Style 15-22 mm; stigma lobes 3, 0.5 mm long. Fruit turbinate, ridged. Hypocotyl 6-12 x 1.5-2 cm, angular, narrowed at both ends.

HABITAT: *B. sexangula* occurs fringing tidal waterways on a variety of substrate types. Salinities from brackish to fresh are tolerated; it was not recorded in salinities greater than 33 ppt. by Wells (1981). Associates include *Rhizophora stylosa, Avicennia marina, Camptostemon schultzii* and *Bruguiera parviflora.*

DISTRIBUTION: *B. sexangula* is only known to occur in north east Arnhem Land. *B. sexangula* also occurs on the north Queensland coast, extra-Australian records from India through south east Asia to New Guinea are reported.



NOTES: This species is similar to both *B. exaristata* and *B. gymnorrhiza*, and has been confused with them in the past. The safest means of correct identification are via the petals, see key to species. Herbarium specimens lacking petals have been the reason for most misidentifications.

The restricted nature of this species in the N.T. has not been recognised previously, due to specimens of *B. exaristata* and *B. gymnorrhiza* being mistakenly identified as *B. sexangula.*

Fertile collections of this species have been made in June and September. The large, downward pointing flowers are bird pollinated. The hypocotyls are dispersed by water.

References: Ding Hou 1958, McCusker 1984.

CAMPTOSTEMON Masters BOMBACACEAE

DERIVATION: The Greek "kamptos" (flexible) and "stemon" (stamen) refer to the bent staminal filaments of this genus.

A genus of two species occurring in south east Asia, *C. schultzii* also occurs in tropical Australia, including tidal areas of the N.T.

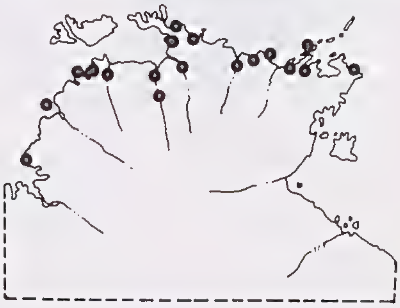
Camptostemon schultzii Masters.

DERIVATION: In honor of M. Schultz, who first collected this species from Port Darwin.

Shrub or tree, occasionally to 22 m; bark grey with longitudinal fissures, stem base fluted, pneumataphores rare. Leaves alternate, petiole to 10 mm, lepidote; lamina elliptic lanceolate, 6.2-9.2 x 2.0-4.1 cm, lepidote below, sparse scales and glands above; apex rounded, base attenuate. Cymes axillary, epicalyx lobes irregular, 2 mm long, subtending mature bud; calyx cup-like, lobes 6 mm long. Corolla lobes 5, obovate, reflexed, 6mm long, exterior lepidote, base connate, pubescent; Staminal tube enclosing style to 4mm; anthers 20, 1mm long, on free portion of filament to 2mm long. Ovary superior, locules 2, uniovular, placentation axillary; style 5mm long; stigmas 2, fleshy, peltate. Capsule obovoid, 1 cm long, lepidote, calyx and epicalyx persistent. Seeds 2, deltoid-obovoid, 9 mm long, densely woolly.

HABITAT: *C. schultzii* prefers soft muddy soils that are regularly inundated, it is commonly found fringing tidal waterways. Associates include *Avicennia marina, Rhizophora stylosa* and *Aegiceras corniculatum.*

DISTRUBITION: *C. schultzii* occurs disjunctly around the N.T. coastline. Also recorded from Western Australia and Queensland, extra Australian records include Papua New Guinea and the Moluccas.



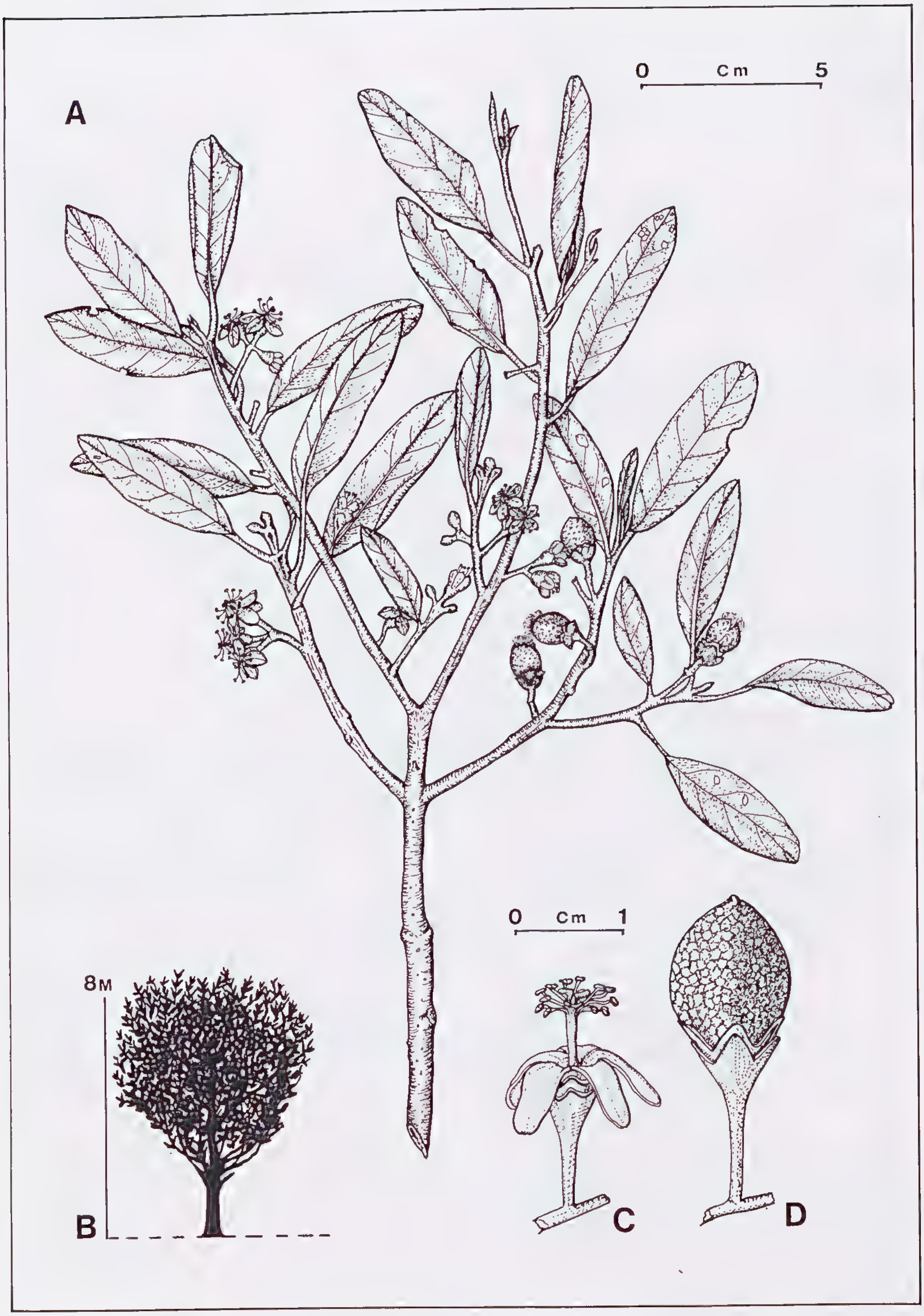


Figure 14. ***Camptostemon schultzii***. A, flowering and fruiting branch; B, habit; C, flower; D, fruit (A-C, G. Wells s.n., DNA 9969; D, Martensz & Schodde 745, DNA).

NOTES: Though no data on *C. schultzii* pollination is available, insects and wind are suspected as pollinating agents. Flowers are produced from June to October, mature capsules appear between October and February. The thick walled, bouyant capsule is capable of medium range water dispersal, the woolly tomentum covering the seeds aid both water and wind dispersal.

The wood of *C. schultzii* is light and bouyant, large trees can regularly be seen deposited at spring high tide marks. Canoes and catamarans were made from this timber by Aboriginals in the Kimberleys (Elliot & Jones 1982). Galiwinku Aboriginals using a water/charcoal mixture as a wash for skin sores and scabies (Anon. 1988). This mixture is also applied to knees of children to hasten walking if they are slow to begin (Wightman & Smith 1989). Ramingining Aboriginals use this species to cure skin disorders, especially leprosy, and use timber for floats (pers. obs.).

CERIOPS Arnott RHIZOPHORACEAE

DERIVATION: From the Greek "ceras" (horn) and "-opsis" (appearance) a reference to the horn-like appearance of the developing hypocotyl.

A genus of two species, occurring on tropical coasts of the Indian and Pacific oceans, both species occur in N.T. mangrove communities.

Shrub or small tree to 5m; viviparous; stem base flanged. Leaves decussate, simple, entire, glabrous, elliptic to obovate. Stipules lanceolate. Inflorescence a 3-many-flowered, dense cyme; bracteoles 2, base connate, apex ovate. Calyx lobes 5-6, ovate, acute. Corolla lobes 5(-6), each embracing 2 stamens, involute. Stamens 10(-12) anthers 4 locular. Ovary half-inferior, 3-locular, 2 ovules per locule. Style terete, simple; stigma simple or obscurely 4-lobed. Fruit ovoid, calyx lobes persistent, spreading. Hypocotyl narrowly clavate, terete or angular.

KEY TO SPECIES:

1. Petals fringed; peduncle short, erect, robust ....*C. decandra*
1. Petals with 3 clavate lobes; peduncle long, pendulous, slender ....*C. tagal*

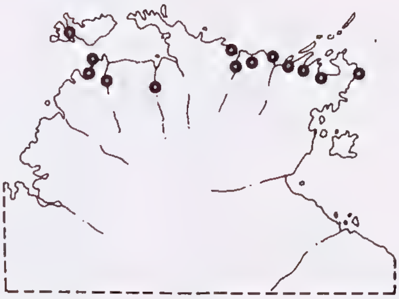
Ceriops decandra (Griff.) Ding Hou

DERIVATION: From the Latin "dec" (ten) and "andra" (male) referring to the ten anthers possesed by this species.

Small tree or shrub to 5 m; bark brown (rarely grey or cream), smooth to flakey. Leaf lamina elliptic-oblong, 3.0-9.8 x 1.3-4.3 cm, slightly bifacial, apex obtuse or emarginate, base cuneate; petiole 0.7-2.0 cm; stipules lanceolate, 1.4-2.2 cm. Inflorescence a 2-4-flowered, axillary, condensed cyme; peduncle 5-8 x 3-4 mm, stout, angular; flowers sessile. Sepals ovate 2.5 x 1.5 mm, acute, erect. Petals ovate, 2 mm long, apex blunt, divided, with fringe of 0.75 mm long hairs. Staminal filaments 1.5 mm long; anthers 1.0 mm. Style 1.0 mm long; stigma minutely 4-lobed. Fruit ovoid-conical, 1.5-1.8 cm long, apex distinctly rounded, sepals erect or ascending. Hypocotyl 9-15 cm long, strongly ridged, sulcate.

HABITAT: *C. decandra* occurs scattered throughout tidal forests, but more commonly toward the landward margins of tidal waterways. Associated species include *Rhizophora* spp., *Bruguiera* spp., *Camptostemon schultzii* and *Avicennia marina*. Sand or mud substrates are preferred.

DISTRIBUTION: *C. decandra* is widespread across the northern coastline, but is not a common component of mangrove vegetation. *C. decandra* also occurs in Queensland. Extra Australian occurrences range from India to New Guinea.



NOTES: *C. decandra* is readily distinguished from *C. tagal* by a number of morphological characters (Table 6). Leaf shape and size of *C. decandra* is highly variable depending on the light and water regimes experienced by individual plants.

Ceriops tagal (Perr.) C.B. Robinson

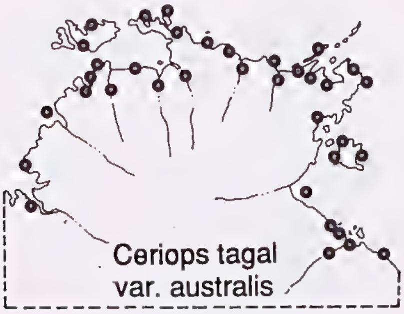
DERIVATION: Derivation uncertain.

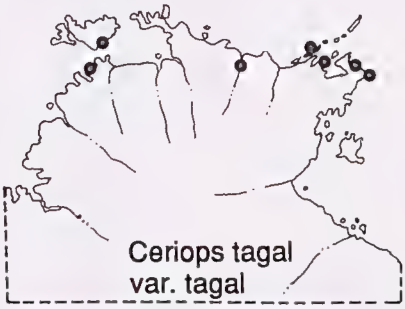
Small tree or shrub to 6 m; bark grey (occasionally brown), stem smooth, flakey at base. Leaf lamina obovate-elliptic, 5.5-10 x 2.0-3.4 cm, apex obtuse to emarginate, base cuneate, margins often involute; petiole 15-25 mm; stipule 8-20 mm. Inflorescence a 5-10-flowered terminal or axillary, resinous, pendulous cyme; peduncle slender, 10-20 mm; pedicel 1-2 mm. Sepals lanceolate-ovate, 4 mm long, apex acute. Petals oblong, 4 mm long, margins cohering via marginal hairs, apex with three clavate 0.5 mm lobes. Staminal filaments 3 mm long; anthers 1 mm long. Style 3.5 mm long; stigma simple. Fruit 0.8-2.5 cm long, sepals persistent, reflexed. Hypocotyl terete or angular, 4.0-25.4 cm long.

HABITAT: *C. tagal* often forms dense shrublands on the landward edge of tidal forests, in areas inundated by high spring tides. These stands may be monospecific or a mixed association of *C.*

tagal, Avicennia marina, Excoecaria ovalis and *Lumnitzera racemosa*. Associations with *Bruguiera parviflora* and *B. exaristata* may also be formed in tidal forests bordering tidal waterways. *C. tagal* prefers clay substrates, and may coexist with *C. decandra.*

DISTRIBUTION: *C. tagal* is widespread and common across the N.T. coast. *C. tagal* also occurs in Western Australia and Queensland, extra Australian distribution is from Mozambique to the Western Pacific.





Two varieties of *Ceriops tagal* are recognised:

1. Hypocotyl 4-10 cm long, terete .... var. *australis*
1. Hypocotyl 15-25 cm long, angular .... var. *tagal*

Ceriops tagal var. ***australis*** C. White

Stipule < 10 mm long; fruit 8-12 mm long.

Ceriops tagal var. ***tagal***

Stipule > 15 mm long; fruit 15-25 mm long.

NOTES: *C. tagal* var. *australis* is by far the most common of the two varieties. *C. tagal* var. *tagal* is known from six localities on the north coast of the N.T.. Whilst these two varieties do co-occur in several areas, no intermediates have been observed. Further investigation may prove these entities to be distinct species.

Aboriginals from Yirrkala use an infusion of the wood or ashes of *C. tagal* to heal sores and infections (pers.obs.). Bardi Aboriginals use the wood to make fishing boomerangs and spears, a red-pink dye is also extracted from the bark (Smith & Kalotas 1985). Malaysians use a decoction of bark in obstetrical and haemorrhage cases, obtain dye from the wood and bark and consider the timber useful due to its longevity when immersed in salt water (Watson 1928).

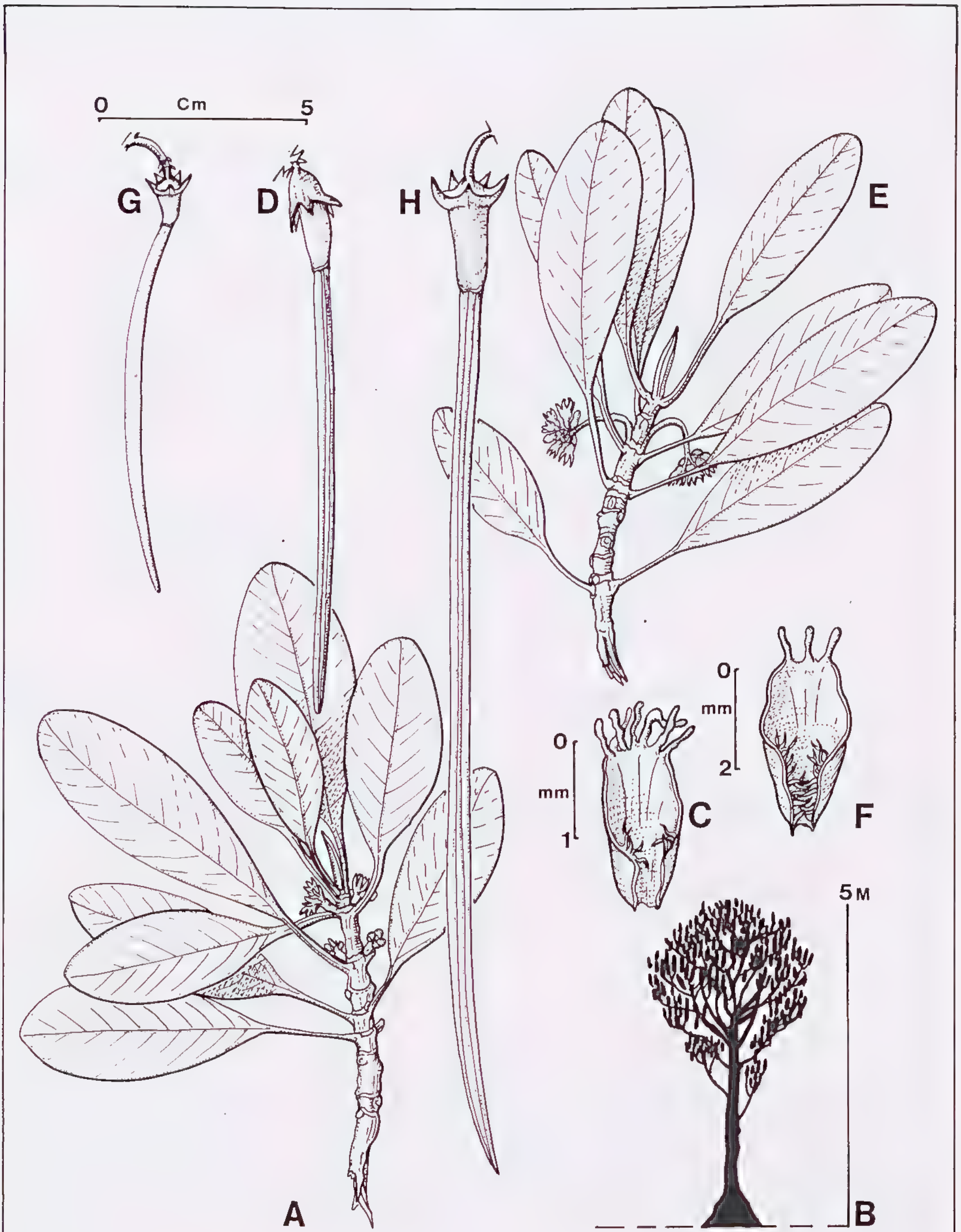


Figure 15. ***Ceriops***. A-D, *C. decandra*. A, flowering branch; B, habit; C, petal; D, fruit and hypocotyl (A-D, G. Wightman 704 & G. Wightman 931, DNA). E-G, *C. tagal var australis*; E, flowering branch; F, petal; G, fruit and hypocotyl (E-G, G. Wightman 207 & G. Wightman 506, DNA). H, *C. tagal var tagal*. H, fruit and hypocotyl (H, G. Wightman 786, DNA).

References: Ding Hou 1958, McCusker 1984.

Table 6: Comparison of morphological characters within *Ceriops*.

Ceriops decandra	***Ceriops tagal***	
Bark brown (rarely grey)	Bark whitish grey (rarely brown)	
Petals fringed	Petals with 3 clavate lobes	
Fruit base round	Fruit base flat	
Flowers on short stout peduncle	Flowers on long slender peduncle	
Calyx lobes erect in fruit	Calyx lobes reflexed in fruit	
	var. ***australis***	var. ***tagal***
Hypocotyl 6-15 cm, long ridged	Hypocotyl 4-10 cm long, terete	Hypocotyl 15-25 cm long, ridged
Fruit 15-18 mm, long	Fruit < 10 mm long	Fruit > 15 mm long
Stipules 14-22 mm long	Stipule < 10 mm long	Stipule > 15 mm long

CYNANCHUM L. ASCLEPIADACEAE

DERIVATION: The Greek "kyno" (dog) and "anche" (to choke) refer to the toxicity of some members of the genus.

A genus of about 155 species, 9-10 of which occur in Australia, six are found in the N.T., one of these, *C. carnosum*, inhabits rear mangal environments.

Cynanchum carnosum (R. Br.) Schltr.

DERIVATION: The Latin "carnosus" (pertains to flesh) refers to the sometimes succulent leaves of this taxon.

Climber; bark smooth, green; stem to 3 cm diameter; latex clear, abundant. Leaves simple,

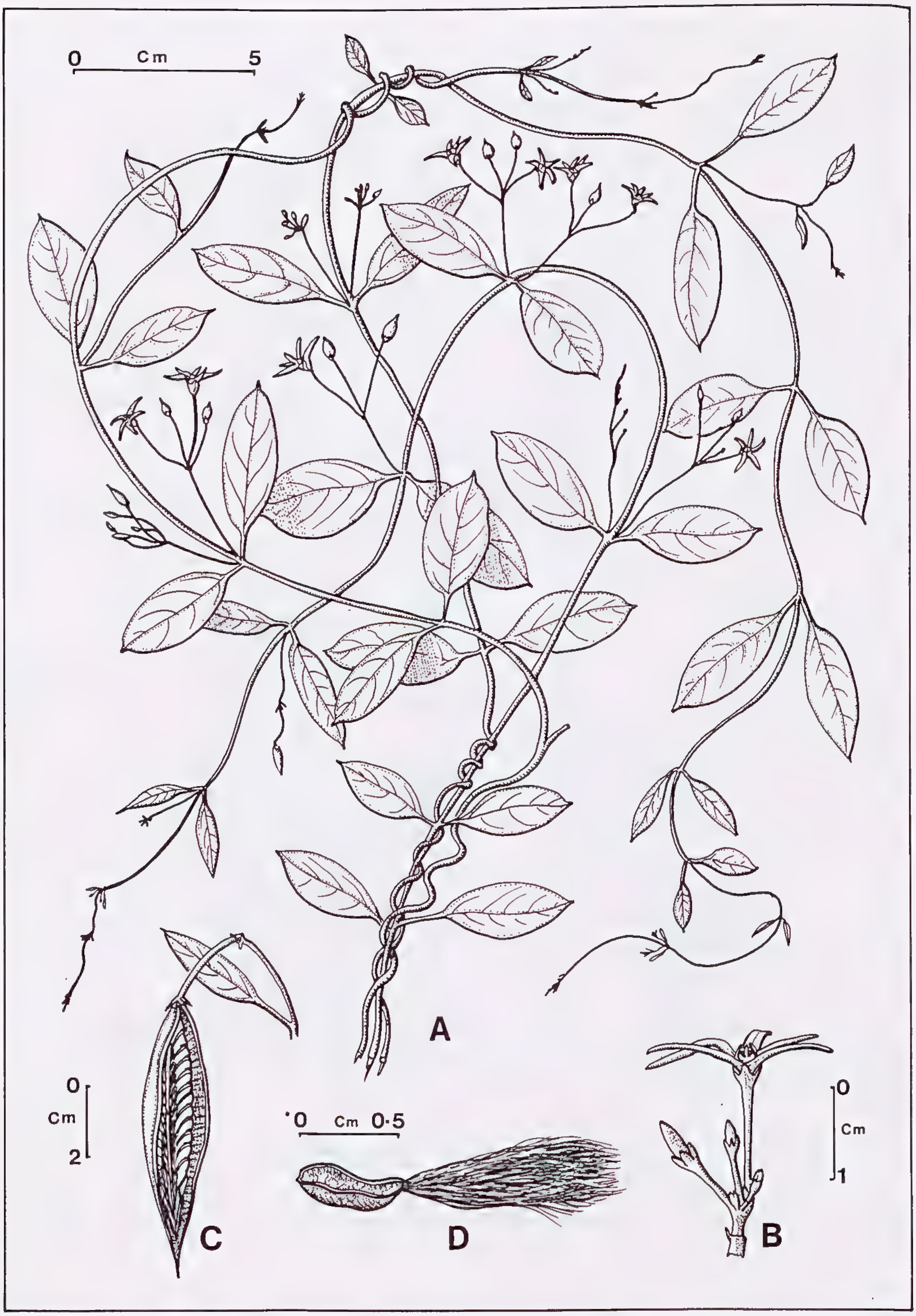
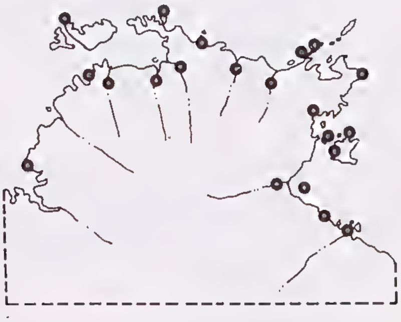


Figure 16. ***Cynanchum carnosum.*** A, flowering branch; B, flower; C, fruit; D, seed (A-B, G. Wightman 988, DNA; C-D, J. Russell-Smith, 1125, DNA).

entire, opposite, narrowly elliptic to broadly elliptic, occasionally linear-lanceolate, 2.5-7.5 x 0.4-3.0 cm, apex spiculate, base attenuate, fleshy to coriaceous, occasionally petiole and under-surface maroon tinged; petiole 4-10 m. Umbels axillary, peduncle to 3.2 cm, pedicel to 1.8 cm. Flowers bisexual, 5-partite, actinomorphic. Calyx lobes triangular, 2 x 1 mm, acuminate. Corolla lobes contorted, narrowly urceolate 7 x 2 mm, acuminate. Corona lobes erect, lanceolate, 2 mm long, acuminate. Staminal filaments short, connate; anthers connate into a tube enclosing style, 2 celled, apex inflexed, triangular, pollen masses 2 per anther. Ovary superior, 2-locular; ovules many per locule; styles united; stigma conical, truncate, 1.5 mm diameter, enclosed almost entirely by anthers. Follicle broad, acuminate, 7.5 x 1.3 cm. Seeds many, brown, ovate, thin, 3 x 5 mm, hairs sticky, white, 15mm long.

HABITAT: *C. carnosum* inhabits landward mangrove areas and may also be found in monsoon vine forests near the coast. Substrates of mud and sand are preferred. Associates include *Avicennia marina, Luminitzera racemosa, Ceriops tagal* and *Bruguiera exaristata.*

DISTRIBUTION: *C. carnosum* is widespread across the N.T. coastline, and extends into Queensland and Western Australia. Extra-Australian occurrences include Malaysia, the Philippines, Indonesia and New Guinea.



NOTES: Flowers are produced year round, though in lesser amounts from November to March, fruits are rarely observed. The small green flowers appear suited to insect or self pollination. Seeds of *C. carnosum* possess a plume of sticky, 1.5 cm long hair which increases seed surface area and enhances dispersal by wind and water.

This species has been referred to as *Ischnostemma carnosum* in the past.

References: Forster 1988.

CYNODON L. POACEAE

DERIVATION: The Greek "kynos" (dog) and "odontous" (tooth) refer to the rhizome buds which resemble dogs teeth.

A genus of some 15 taxa (including varieties), five species occur in Australia, three of which are considered to be introduced. One native species, *C. dactylon*, is widespread and regularly occurs in N.T. tidal areas.

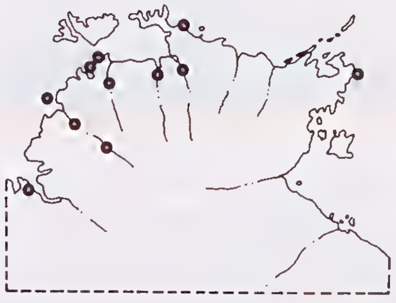
Cynodon dactylon (L.) Pers.

DERIVATION: The Greek "daktylos" (finger or toe) refers to the inflorescence, which is hand-like.

Perennial, stoloniferous or rhizomatous; sterile culms prostrate and rooting at nodes; fertile culms erect, to 15 cm high. Culms with short internodes; stolons usually compressed. Leaf blades 1.5-7.1 x 0.1-0.2 cm, flat or conduplicate, subobtuse, glabrous, scaberlous; ligule 0.3 mm long. Leaf sheath half as long as internodes, orifice with hairs to 3 mm long. Spikes curved. Glumes 1.5 mm long, narrow-lanceolate, acuminate, keel scabrous, thickened. Rachilla internode 1 mm long. Lemma 2-3 mm long, membranous, obtuse, glabrous, smooth, keel ciliate. Palea narrow, subacute, smooth, glabrous, keel scabrous. Anthers 1 mm long. Grain 1 mm long, ellipsoid or obovoid, turgid, obtuse, pallid to brown.

HABITAT: *C. dactylon* is found in a wide variety of habitats, including tidal areas where it can withstand twice daily submersion in sea water. Generally *C. dactylon* is found toward the rear of the mangal in areas that are less frequently inundated, on a variety of soils including laterite, sand, gravel and dark clays.

DISTRIBUTION: *C. dactylon* is widespread across the N.T. coast. Though herbarium records are lacking from most of eastern N.T. this is a reflection of undercollecting rather than real distribution. *C. dactylon* also occurs in all other Australian states, and is regarded as being cosmopolitan, native in warm regions and cultivated or naturalised in temperate regions.



NOTES: *C. dactylon* is a very hardy, salt tolerant species, capable of forming a lawn in areas subjected to twice daily tidal submersion. *C. dactylon* is cultivated throughout the world as a pasture and lawn species. It is commonly called "couch grass". Fertile spikes are produced from May to October. All material of *C.dactylon* examined from the N.T. is referrable to variety *dactylon*.

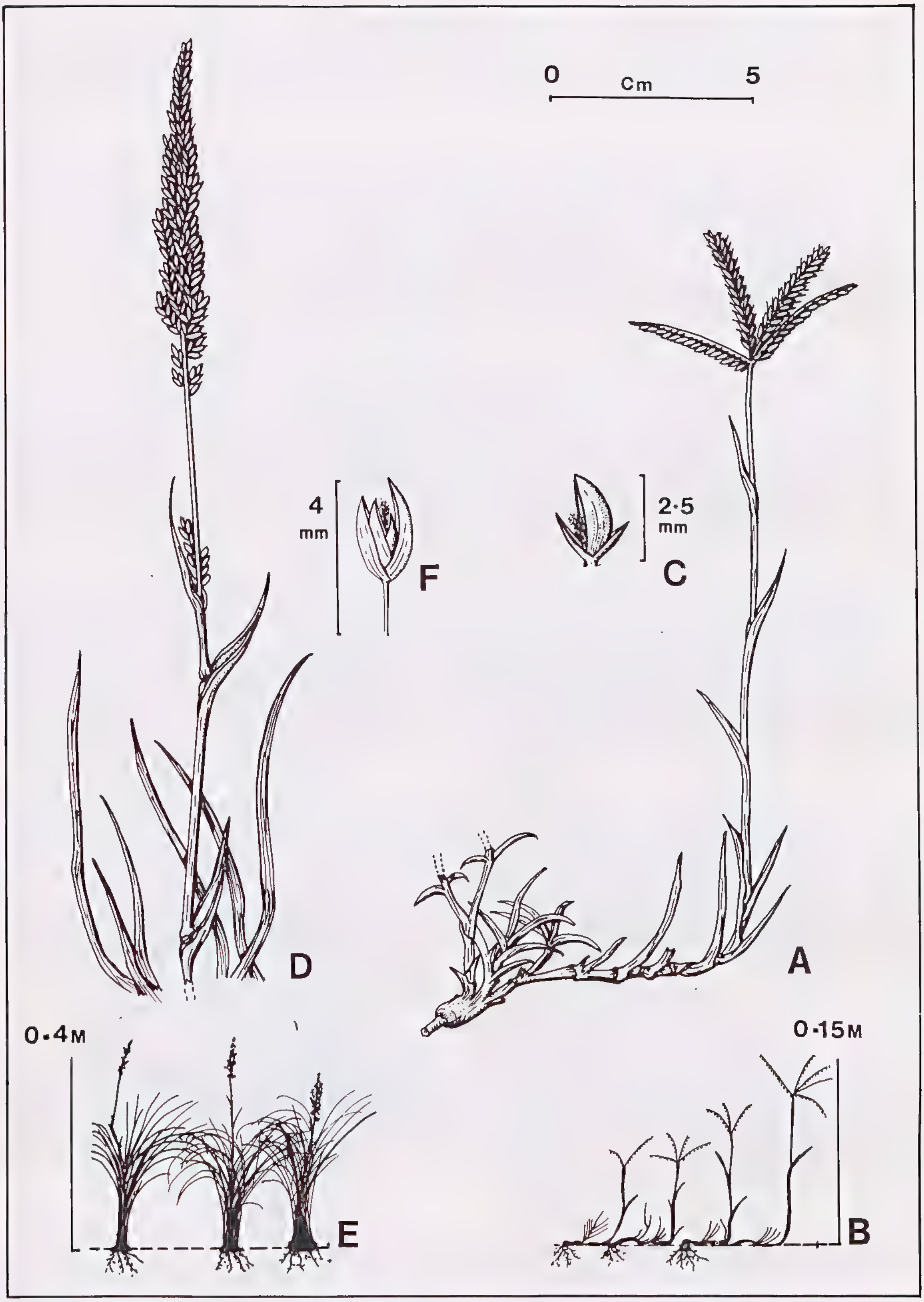


Figure 17. ***Cynodon dactylon*** and ***Sporobolus virginicus***.. A-C, *Cynodon dactylon*. A, fertile culm; B, habit; C, spikelet (A-C, M. Rankin 2407, DNA). D-F, *Sporobolus virginicus*. D, fertile culm; E, habit; F, spikelet (D-F, C. Robinson s.n., DNA 5671).

DERIVATION: The Greek "kyno" (dog) and "metra" (uterus) refer to the fruit's resemblance to the shape of a bitch's womb.

A pantropic genus of about 70 species, two species occupy rear mangal habitas; one of these, *C. iripa*, occurs in Australia and is known from three localities in the N.T.

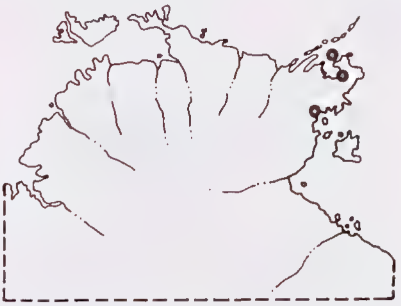
Cynometra iripa Kostel.

DERIVATION: The latin "ir" (in, into) and "ripa" (bank of steam) refer to the habitat of this species, beside tidal waterways.

Tree or shrub, spreading to 6 m; bark brown, tight, smooth. Leaves disichous, bijugate, leaflets of lower pair smaller than upper pair; lower pair 2.0-3.1 x 1.0-1.6 cm, upper apri 4.3-5.6 x 2.3-2.9 cm; leaflets assymetrically elliptic, apex emarginate with minute apicule in sinus, base assymetrically attenuate; petiole rugose, 3 mm long; rachis 10-15mm long with brown pustules; petiolule rugose 1 mm long, all shortly hairy. Stipules caducous. Racemes exillary, sessile, simple; in bud densley contracted, almost globular, clothed in bracts. Rachis 3-4 mm long, pubescent; pedicel 4-6 mm long; bracts scale-like, 1 mm long, bracteoles obovate 2 mm long. Flowers bisexual; receptable campanulate. Calyx lobes 4-5, 3 mm long, reflexed at anthesis. Corolla lobes 5, narrow, 2.0-0.3 mm, glabrous. Stamens 10; filament 3.5 mm long; anther 0.5 mm long, apiculate. Ovary uni-locular, stiptate, densely hairy; style 3 mm long, glabrous, askew from ovary; stigma small. Pod woody, subglobular with distinct beak, 1.8 x 3.0 cm, surface deeply rugose, shortly hairy. Seed(s) 1 (2), rarely formed.

HABITAT: *C. iripa* occurs in rear mangal environments, in areas that receive perennial freshwater input. Often associated with it in this situation is *Bruguiera sexangula*. *C. iripa* may also occur in areas above the high tide mark.

DISTRIBUTION: *C. iripa* is known from three localities in north-east Arnhem Land. This species also occurs in Queensland, extra Australian localities include India, Malaysia, Thailand, Indonesia and the Philippines.



NOTES: Lassak and McCarthy (1981) report Indians using *C. iripa* as a purgative and a treatment of scabies and leprosy. The timber may be used sructurally and as a source of dye (Maiden 1889).

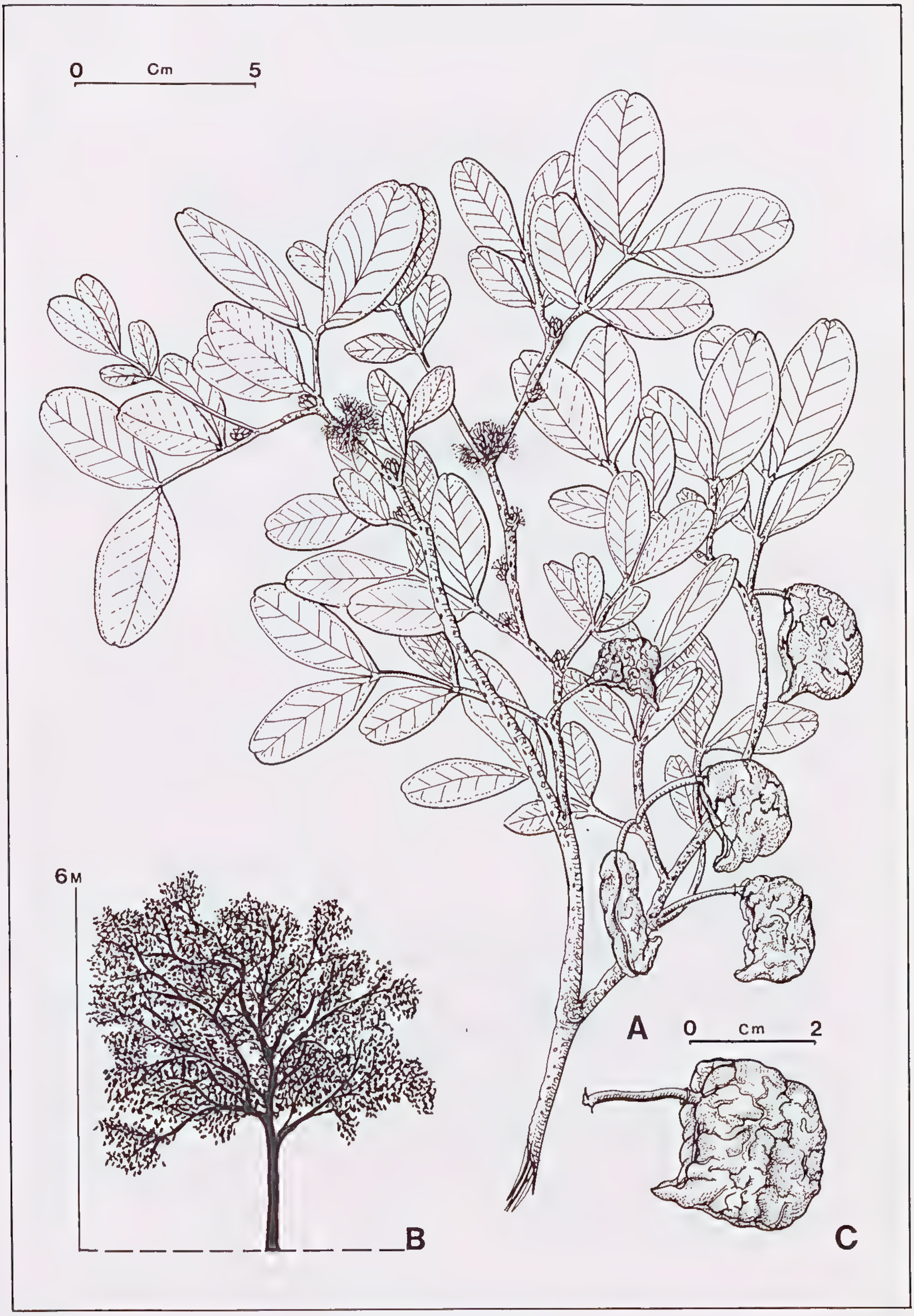


Figure 18. ***Cynometra iripa.*** A, flowering and fruiting branch; B, habit; C, fruit; (A, J. Elsol 654, BRI; C, C. White 10120, BRI).

In the past *C. iripa* has been confused with *C. ramiflora* L., however Knapp-van Meeuwen (1970) concludes that *C. ramiflora* does not occur in Australia.

The fruit is capable of floating for up to 2 months, due to bouyant tissue in the fruit wall (Guppy 1906). However this species rarely produces viable mature seed though flowering may be intense (Knaap van Meeuwen 1970). Little can be said about phenology of this species in the N.T., as fruiting collections have been made only in October and December. However, Queensland populations of *C. iripa* produce flowers during May to October, fruit have been collected in January, May and June.

References: Knaap-van Meeuwen 1970.

DALBERGIA L.f. FABACEAE

DERIVATION: In honor of brothers Nils and Carl Dalberg, both botanically orientated, the latter sending specimens to Linnaeus.

A genus of some 330 tropical species, two species occur in Australia, one in tidal areas of the N.T.

Dalbergia candenatensis (Dennst.) Prain

DERIVATION: "candenatensis" (coming from Candenat) probably in reference to the area where this species was first collected.

Climber to 8m long, stems twining, to 5 cm diameter; bark dark grey, lenticellate. Leaves alternate, unequally pinnate, 4-13 cm long; leaflets 3-7, petiole 1-2 mm long, lamina 1.5 - 3 x 2.0 - 4.1 cm, obovate or elliptic, apex rounded or emarginate, base cuneate, upper surface dark green, lower surface glaucous with distinct reticulate venation. Racemes axillary, branched, 5-50 mm long, rhachis shortly pubescent. Flowers bisexual, zygomorphic. Calyx 5-lobed, laterals reduced, upper lobes joined. Corolla small, white. Ovary superior, ovules few; style curved; stigma small. Stamens 10, upper 1 free, others fused; anthers dorsifixed. Pods sickle-shaped, indehiscent, 2-3.5 x 1.3-1.5 cm, stipitate, calyx persistent. Seeds 1-2, kidney-shaped, 18-23 mm long, reticulately veined, glabrous.

HABITAT: *D. candenatensis* has been found growing in silt and sand substrates, at the landward edge of mangal communities. It appears intolerant of frequent salt water inundation, preferring areas with perennially high freshwater input. Associates include *Nypa fruticans, Rhizophora apiculata, Bruguiera gymnorrhiza* and *Acrostichum speciosum.*

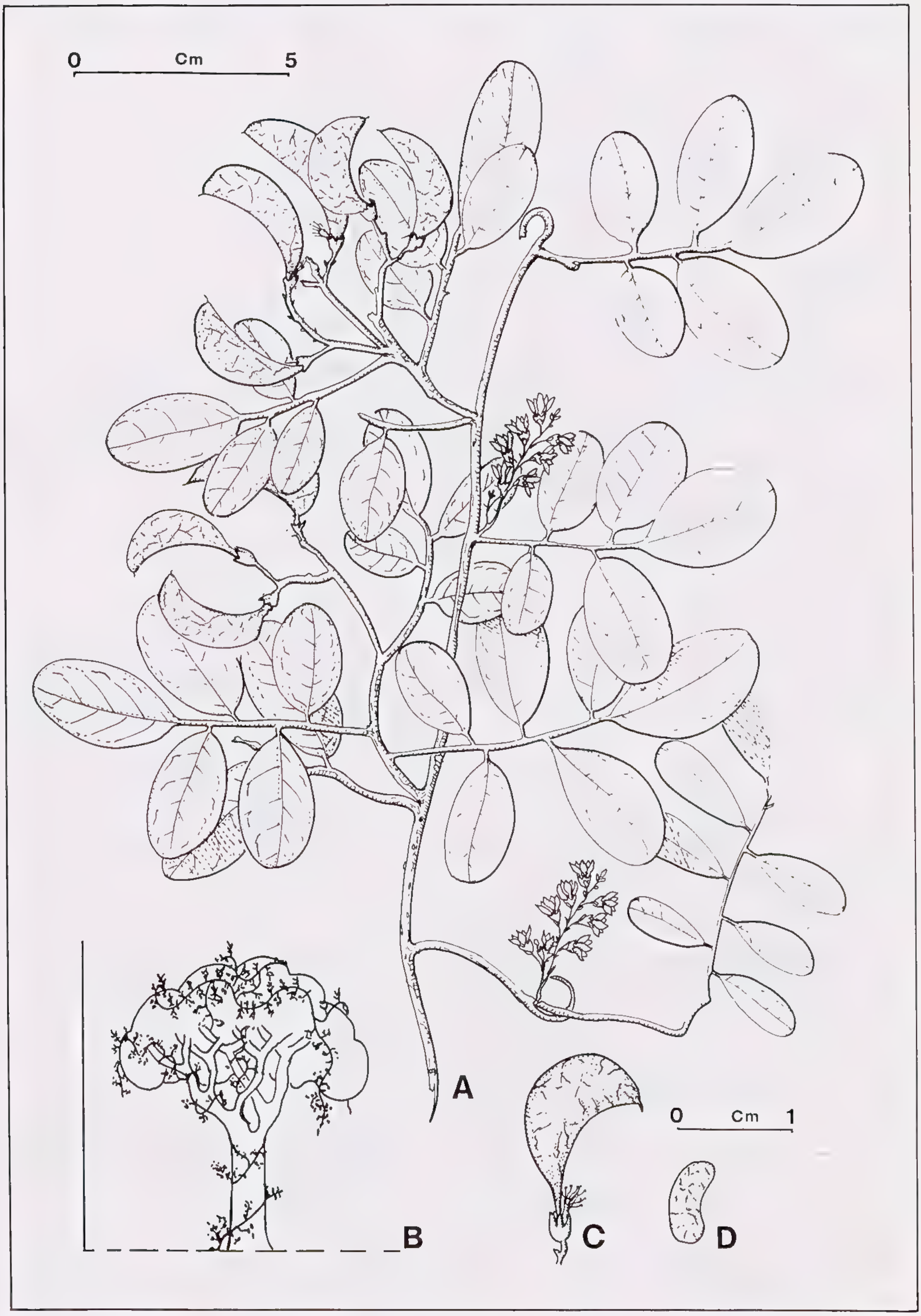
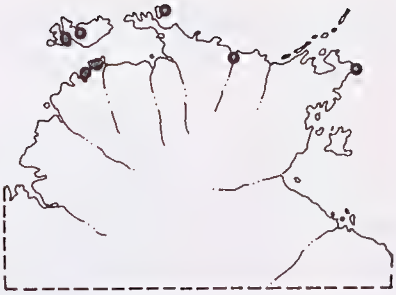


Figure 19. ***Dalbergia candenatensis***. A, flowering and fruiting branch; B, habit; C, fruit; D, seed (A, L. Webb and J. Tracey 6117, BRI; C-D, C. White s.n., BRI 344037).

DISTRIBUTION: *D. candenatensis* has a limited distribution in the N.T. *D. candenatensis* also occurs in Queensland, extra Australian records include India, China and throughout south east Asia including the Indonesian archipelago.



NOTES: Many woody species of the genus *Dalbergia* are utilised for their timber, e.g. *D. sissoo* (India), *D. melanoxylon* (Africa) and *D. nigra* (Brazil).

The 1-2 seeded indehiscent fruit is adapted to water and wind dispersal. Guppy (1906) relates the bouyancy of the fruit due to the unoccupied space between the fruit wall and seed, bouyancy persists for a few weeks to several months. In contrast van der Pijl (1969) considers the fruit morphology combined with climbing habit "on the road" to wind dispersal. Buds occur in October, while fruits are present in May.

References: Verdcourt 1979.

DERRIS Lour. FABACEAE

DERIVATION: The Greek "derros" (leathery covering) refers to the leathery fruit of this genus.

A genus of 80 tropical or subtropical species, three occur in Australia, one in N.T. tidal areas.

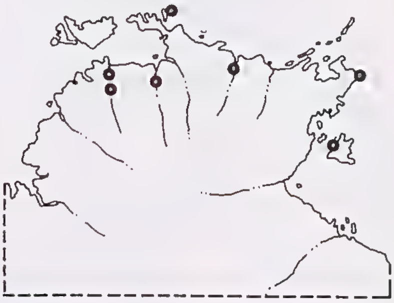
Derris trifoliata Lour.

DERIVATION: The Latin "tri" (three) and "foliatus" (leafleted) refers to the compound leaf of this species, which occasionally has three leaflets.

Climber, often rambling, stems woody to 5 cm diameter; bark smooth, dark brown, lenticels orange, corky. Leaves alternate, imparipinnate, 9-25 cm long, stipules minute; petiole 3-8 cm; leaflets 3-7; petiolule swollen, 5 mm long; lamina ovate or elliptic, 6-13 x 2-6 cm, apex acuminate, base rounded, upper surface glossy, green, lower surface dull, grey-green. Inflorescence racemose, axillary, on prostrate stems, 7-20 cm long. Flowers bisexual, zygomorphic; pedicel 2 mm long; bracts 2, deltoid, 0.5 mm long, margin ciliate. Calyx cupular, 1.5 mm long, lobes 5, short, broad, margins ciliate. Corolla lobes 5, imbricate, upper lobe orbicular to obovate 10 x 9 mm, side lobes elliptic, 10 x 3 mm; lower 2 lobes adnate, straight, 10 x 6 mm, apex deeply emarginate. Stamens 10, upper 1 free, lower 9 connate; filaments 9 mm long; anthers 2 celled, ovate, 1 mm long, dorsifixed. Style filiform, 11 mm long; stigma small, capitate. Pod oblong or suborbicular, flat, inflated, 2-4.5 x 2.7-3.7 cm; apex and base obtuse, style base persistent, coriaceous, venation distinct. Seeds 1-2, rugose, suborbicular, 12 x 11 mm, bronze-green when dry.

HABITAT: *D. trifoliata* grows in mud and sand substrates toward the landward margin of mangal habitats, it prefers areas with a high freshwater input, infrequently inundated by tidal movements. Associates include *Sonneratia lanceolata, Avicennia marina* and *Hibiscus tiliaceus.*

DISTRIBUTION: *D. trifoliata* is distributed widely across the N.T. coastline but is not a common constituent of mangal floras. *D. trifoliata* also occurs in Queensland and extends through south east Asia and India to China and Africa.



NOTES: The fish stupefying and poisoning properties of *Derris* spp. are well known and documented (e.g. Watson 1928, Baines 1981). The commercial insect poison "rotenone" or Derris dust is derived from the tuberous roots of a south east Asian species of *Derris. D. trifoliata* has been used by Cape York Aboriginals to poison fish (Elliot & Jones 1984) and has the advantage of being useful in both salt and fresh water. Vanuatu tribesmen dip poison arrow heads in an infusion of *D. trifoliata* to add more zest, Indians use the stems as rope. Elliot & Jones (1984) believe this species is suitable for embankment stabilization.

Flowers are produced from September to November, fruits occur in November and December. The pods and seeds of *D. trifoliata* are adapted to water dispersal. The inflated, coriaceous pod can attribute its bouyancy to air cavities between the pod and seed. An air cavity is produced in the seed when, during final maturation, the cotyledons arch away from each other (Guppy 1906). Van der Pijl (1971) considers the pods of *Derris* spp. also evolved toward wind dispersal. However, wind is not a major agent of dispersal for *D. trifoliata* because most fruit are produced on lateral stems at ground level.

This species has been referred to as *D. uliginosa* in the past.

References: Verdcourt 1979.

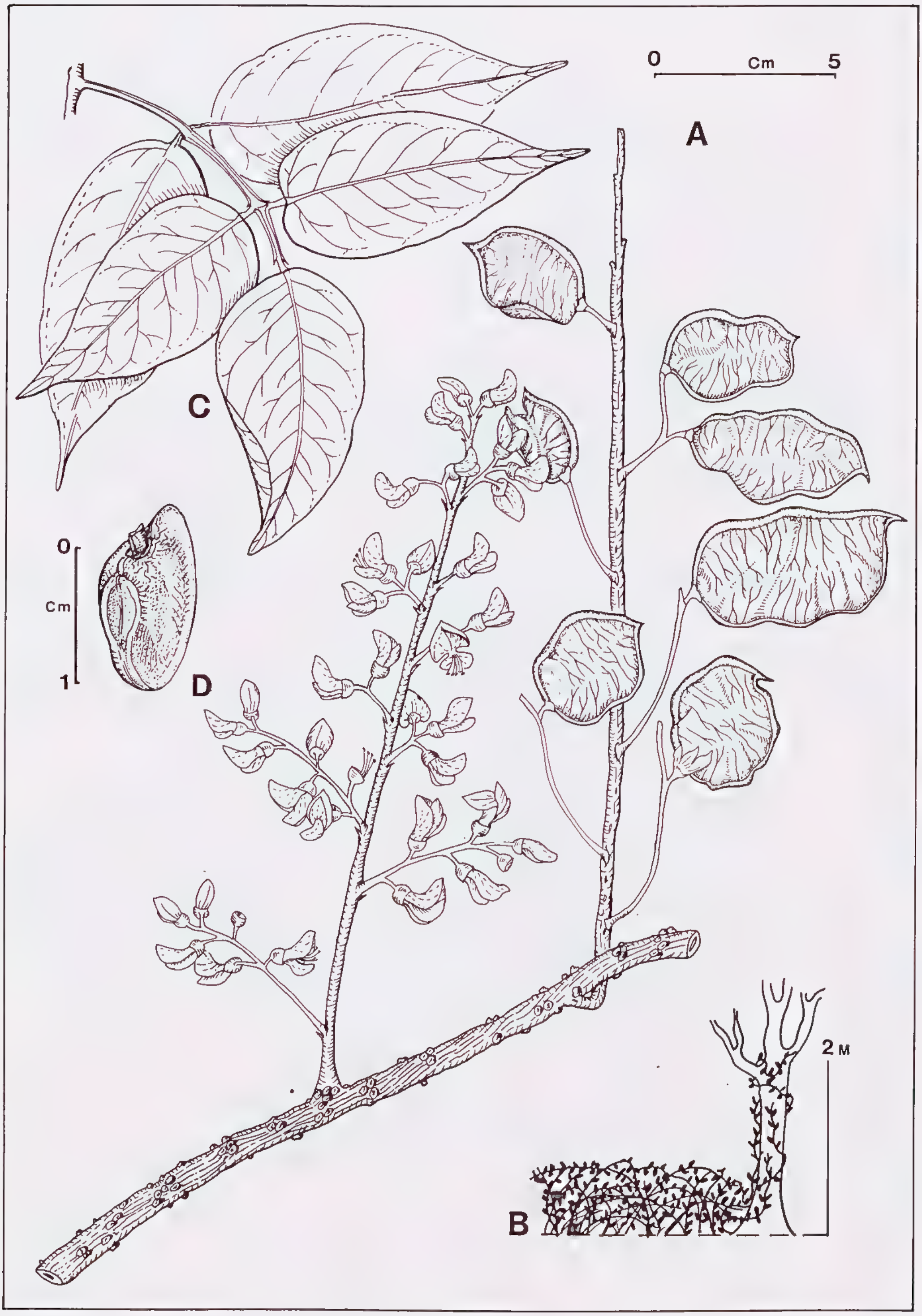


Figure 20. ***Derris trifoliata***. A, flowering and fruiting lateral stem; B, habit; C, leaf; D, seed (A-D, G. Wightman 2352, DNA).

DIOSPYROS Dalech ex L. EBENACEAE

DERIVATION: The Greek "dios" (divine, godlike) and "pyros" (wheat) appear to be a reference to the fruit of the gods, application uncertain.

A genus of 400 species of tropical and subtropical areas; of the eight species occurring in the N.T., two regularly occur in tidal situations.

Trees, mostly dioecious; pneumatophores knotted, lenticelled. Leaves simple, entire, alternate, elliptic to broadly elliptic. Flowers mostly unisexual. Male flowers borne in axillary, cymose clusters; pedicel 1 mm long, tomentose; peduncle 2-5 mm long, tomentose. Calyx 2-3-lobed. Corolla 2-4-lobed. Stamens 6-8, in pairs, adnate to receptacle; filament 2 mm long; anther narrowly-triangular, 3mm long, acute, dithecal, basifixed. Pistillode vestigial. Female flowers solitary, axillary; pedicel 2-3 mm long. Calyx and corolla as for male flowers. Ovary globose, glabrous, locules 2, ovules 1-2 per locule; style simple; stigma rounded. Pistillode absent or vestigial. Berry subglobular to to oval. Seeds semicircular to wedge-shaped.

KEY TO SPECIES:

1. Berry subglobular, calyx reflexed .... *D. compacta*
1. Berry oval or elliptic, calyx clasping fruit .... *D. littorea*

Diospyros compacta (R. Br.) Kosterm.

DERIVATION: The Latin "compacta" means compact, application uncertain.

Tree to 11 m; bark smooth, mottled grey to platy, black. Leaf lamina broadly elliptic, 4.9-10 x 2.7-4.9 cm, coriaceous, upper surface shining, margin recurved, venation reticulate, distinct, apex blunt, base obtuse; petiole curved, 4-6 mm long. Male flowers; calyx 6 mm long, slightly tomentose, lobes 2 mm long, obtuse. Corolla 8 mm long, lobes 3 mm long, reflexed, acute, exterior slightly tomentose. Stamens 8. Female flowers; calyx and corolla as for male flowers. Style 1 mm long; stigma 0.7 mm diameter. Berry subglobular 1.3 x 1.0 cm, calyx persistent, lobes reflexed, interior densely villous, exterior glabrous; style base persistent. Seeds 2-5, semi-circular, 5 mm long, dark brown, surface slightly rugose.

HABITAT: *D. compacta* is found toward the landward margin of mangrove habitats, often occurring in the ecotone between mangrove and terrestrial vegetation. This species also occurs toward the freshwater end of tidal creeks. Soils colonised include sands, muds and laterite. *D. compacta* regularly inhabits non-mangrove vegetation.

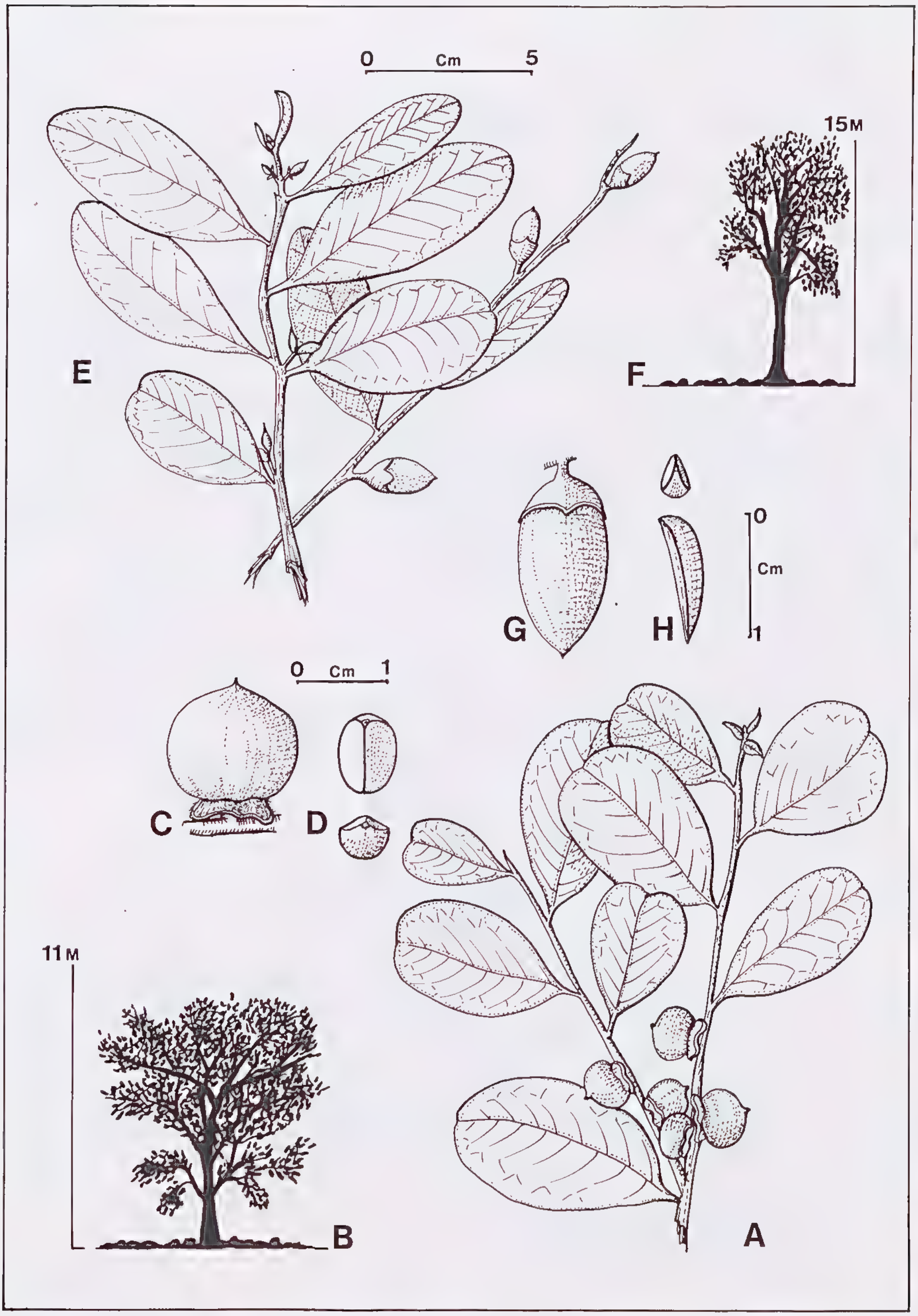
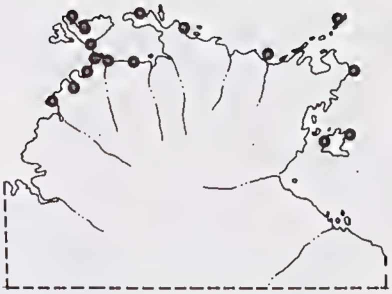


Figure 21. ***Diospyros***. A-D, *D. compacta*. A, fruiting branch; B, habit; C, fruit; D, seed (A-D, M. Rankin 2385, DNA). E-H, *D. littorea*. E, fruiting branch; F, habit; G, fruit, H, seed (G. Wightman 1732, DNA).

DISTRIBUTION: *D. compacta* occurs sporadically around the N.T. coastline. This species is also found in Western Australia and Queensland and is endemic to Australia.



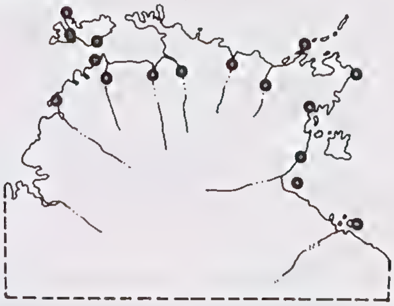
Diospyros littorea (R. Br.) Kostermans.

DERIVATION: The Latin "littorea" (seashore) refers to the coastal habitat of this species.

Tree to 15 m, occasionally multistemmed; bark mottled grey, smooth; rarely with finger like pneumatophores. Leaf lamina narrowly elliptic to obelliptic, 5.9-9.4 x 2.5-4.4 cm, upper surface somewhat dull; venation reticulate, inconspicuous; petiole curved, 4-5 mm long. Male flowers; calyx 4 mm long, loosely adhering to corolla. Corolla 6 mm long, densely tomentose, lobes 1-2 mm long, acute. Stamens 6-8. Female flowers; calyx and corolla as for male flowers. Style 0.8-1.5 mm long ; stigma rounded. Berry oval-elliptic, 10 x 14 mm, calyx persistent, lobes appressed to berry; pedicel 4 mm long. Seeds 5-6, semicircular wedge-shaped, 10 x 4 mm, surface dark brown, rugose.

HABITAT: *D. littorea* occurs towards the landward margin of mangals, often between mangrove and terrestrial habitats. Sands and muds are colonised. Common associates include *Lumnitzera racemosa, Avicennia marina* and *Ceriops tagal* var. *australis*. This species also occurs in monsoon vine forests and coastal non-mangrove vegetation.

DISTRIBUTION: *D. littorea* is widespread and common across the N.T. coastline and also occurs in Queensland and Western Australia. Extra Australian distribution includes New Guinea and Thailand.



NOTES: Both species produce flowers from October to December while fruits are found throughout the year, but in higher numbers from November to May. Both species appear to be dioecious, though further field data is required to assess sexuality of individual plants. Flowers are suited to insect pollination and both species have relatively low fruit set.

Fruit of *D. compacta* are eaten by Aboriginals when they turn yellow, ebony is derived from trees of the genus *Diospyros*.

Nomenclature in the genus *Diospyros* has been confused, previously both *D. littorea* and *D. compacta* have been known as *Diospyros ferrea* var. *reticulata*, by Australian authors.

References: Jessup, L.W. *in litt.* 1987; Kostermans 1974.

EXCOECARIA L. EUPHORBIACEAE

DERIVATION: The Latin "excaecare" (to blind) is a reference to the white latex, characteristic of this genus, which is reputed to cause blindness.

A genus of about 40 species, distributed through tropical Asia, western Pacific and Africa. Four species occur in Australia, three species in the N.T., two inhabit mangrove communities.

Small trees or shrubs, usually single stemmed, glabrous, dioecious. Leaves simple, alternate, entire, petiolate, bearing 2 glands at leaf base. Stipules minute. Inflorescence axillary, spicate. Flowers arranged spirally, sessile, subtended by a 2 x 1 mm, broad, blunt bract and 2 smaller, lanceolate bracteoles. Glands 3-4, in groups at end of bracteoles. Tepals 3. Male Flowers: stamens 3; anthers bilocular, obcordate, versatile, longitudinally dehiscent; pistilode absent. Female flowers: ovary superior, 3 locular, locules uniovular; style short; stigmas 3, curved, persistent. Capsule 3 lobed. Seeds 3, subglobose, brown.

KEY TO SPECIES:

1. Leaf margin crenulate, apex acuminate, petiole > 18 mm long .... *E. agallocha*
1. Leaf margin entire, apex blunt, petiole < 17 mm long .... *E. ovalis*

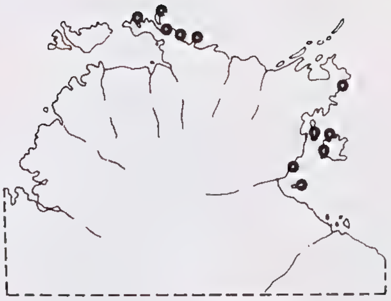
Excoecaria agallocha L.

DERIVATION: Possibly a reference to this species resemblance to *Aguilaria agallocha* of Asia.

Tree to 7 m; bark grey, smooth, pustular (rough in larger specimens); roots often knotted and lenticellate above ground surface. Leaves ovate or elliptic, 6.5-10.5 x 3.5-5.2cm, apex acuminate, base cuneate, margin crenulate; petiole 1.8-3.0 cm. Male inflorescence to 11 cm long, diffuse. Tepals narrowly ovate, 1 x 0.5 mm. Anthers 1.0 mm long, filament 2.0 mm long. Glands between stamens and inflorescence axis subglobular, sessile, 0.5 mm long. Female inflorescence to 3 cm long. Stigma lobes 3 mm long. Infructescence: pedicel to 6 mm long; peduncle to 16 mm long. Capsule 14 mm diameter. Seeds dark brown, streaked, 5 mm diameter.

HABITAT: *E. agallocha* prefers sandy substrates and requires freshwater input for a large part of the year. It is commonly found at the landward margin of mangals, in swales or occasionally above the high tide mark.

DISTRIBUTION: *E. agallocha* is known from two fairly discrete areas in the N.T. One centres around Groote Eylandt on the east coast, and the other on the central northern coast near Murganella. This species also occurs in Queensland and New South Wales, extra Australian distribution includes much of the Asian tropics.



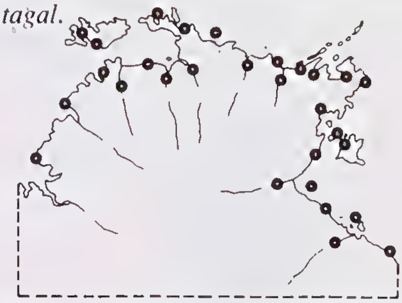
Excoecaria ovalis Endl.

DERIVATION: The latin "ovalis" (oval, elliptic) refers to the leaf shape of this species.

Shrub or small tree to 4 m; bark grey, smooth, with horizontal fissures and lenticels; roots occasionally knotted and lenticellate above soil surface. Leaves obovate or elliptic, 3.0-7.5 x 1.8-5.5 cm, apex blunt, base cuneate, margin entire; petiole 0.5-1.7 cm. Male inflorescence to 4 cm long, crowded. Tepals lanceolate, 1 x 0.2 mm. Anthers 0.7 mm long; filament 1.5 mm long. Glands between stamens and inflorescence axis vestigial. Female inflorescence up to 3 cm long, few-flowered, stigma lobes 2 mm long. Capsule 1.0 cm diameter. Seeds light brown, mottled, 3 mm diameter.

HABITAT: *E. ovalis* colonises sand and mud substrates, and is capable of withstanding highly saline conditions. It forms stands with *Avicennia marina* on highly saline sites along tidal waterways. *E. ovalis* also occurs around mudflats and in coastal mangals. Other common associates include *Lumnitzera racemosa* and *Ceriops tagal.*

DISTRIBUTION: *E. ovalis* is widespread on the N.T. coastline. This species also occurs in Western Australia and Queensland and is probably an Australian endemic.



NOTES: *E. agallocha* was described by Linnaeus in 1759. *E. ovalis* was described by Endlicher in 1833, from material collected by Ferdinand Bauer in the Gulf of Carpentaria. Jean Mueller (Muell. Arg.) reduced this species to a variety of *E. agallocha* in 1866, later still, H.K. Airy Shaw reduced the name, *E. ovalis*, to synonomy under *E. agallocha.* Examination of *Excoecaria* material from N.T. mangals shows two taxa are present, and that the name *E. ovalis* Endl. should be applied to the Australian endemic taxon, initially collected by Bauer in the Gulf of Carpentaria in 1803. Mueller also collected this taxon, from the Gulf of Carpentaria in 1855-6. The sheet

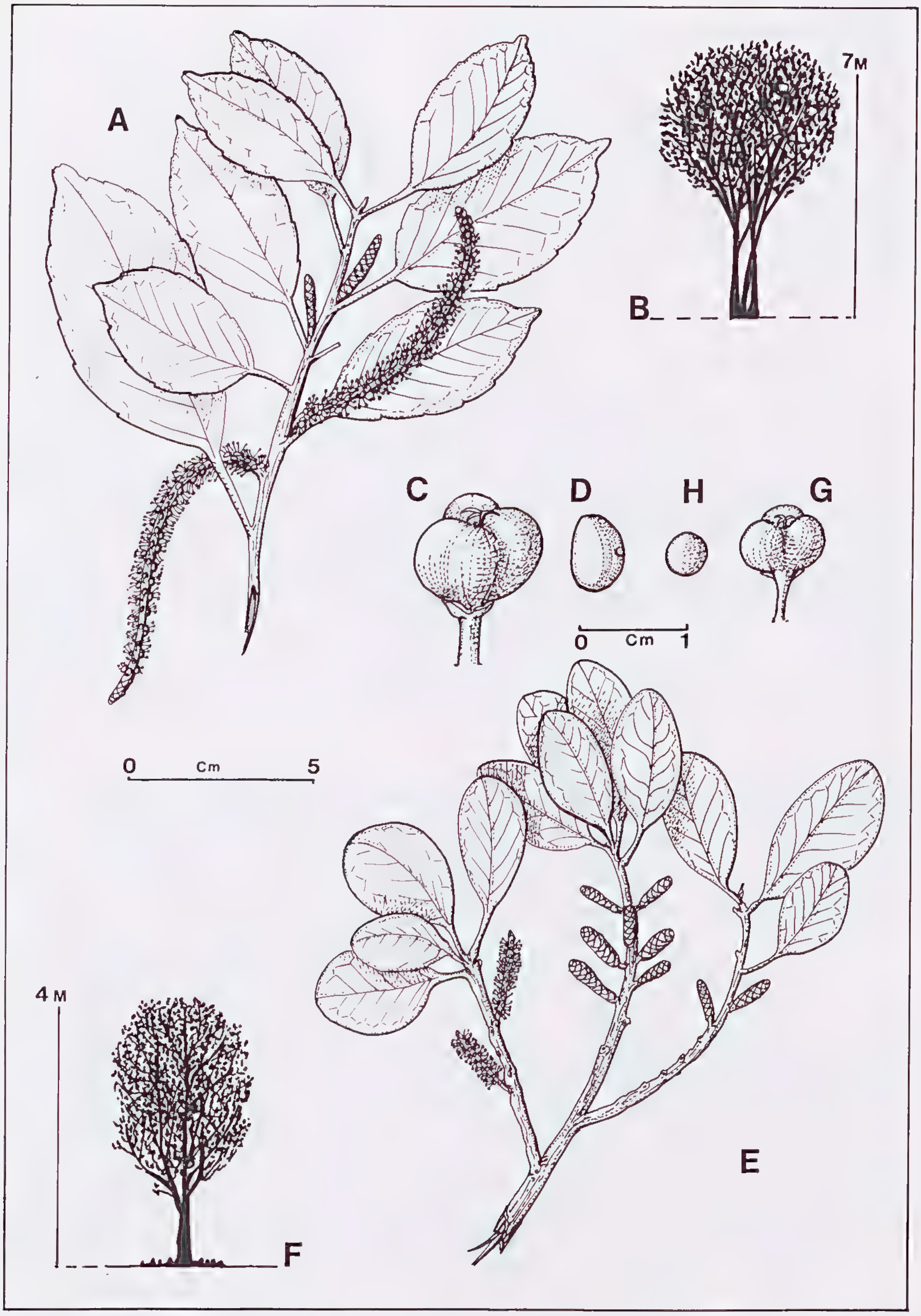


Figure 22. ***Excoecaria.*** A-D, *E. agallocha.* A, flowering branch; B, habit; C, fruit; D, seed (A-D, G. Wightman 969 and G. Wightman 978, DNA). E-H, *E. ovalis.* E, flowering branch; F, habit; G, fruit, H, seed (E-H, G. Wightman 823 and N. Byrnes 2386, DNA).

housed in MEL. bears the name "*Excoecaria sphaerosperma* F. Muell" in Muellers hand writing. This name was never published.

E. *agallocha* produces flowers from October to February and fruit from December to March. Leaf fall (partial or complete) occurs around November-December and new leaves are produced from December to February. New foliage has a varnished appearance and is bifacial. *E. ovalis* flowers from October to December and fruits from December to February. Leaf fall occurs before flowers are produced and new foliage production generally coincides with flowering. New leaves are not varnished nor bifacial, but may be shallowly crenulate. Pollination by insects is suspected because of the presence of nectar producing glands (at the end of the bracts, below the flowers) and the sticky pollen. Bees are the chief pollinators (Tomlinson 1986).

While many Aboriginals consider *Excoecaria* spp. to be toxic due to the white latex (Wightman and Smith 1989) they are also widely used medicinally by Aboriginals. Lassak and McCarthy (1984) report the latex being used to treat chronic diseases such as leprosy, also marine stings, while a decoction of bark is used for body pains and sickness. Groote Eylandt Aboriginals use *Excoecaria* timber for floats and firewood, while the flowers are a good source of nectar for native bees (Levitt 1981). In Malaysia, toothache and swelling are treated with the roots of *Excoecaria agallocha* (Watson 1928). Maiden (1889) notes the timber being useful for carving.

References: Wightman, G.M.(in prep.). The reinstatement of *Excoecaria ovalis* Endlicher.

HALOSARCIA Paul G. Wilson CHENOPODIACEAE

DERIVATION: The Greek "halos" (salt) and "sarcia" (flesh) refer to the succulent stems of the genus.

A genus of 23 species, all are Australian endemics except *H. indica*, which extends its range to other areas bordering the Indian Ocean. Two species occur in N.T. tidal areas, *H. indica* and *H. halocnemoides*.

Erect or decumbent perennial shrubs, glabrous. Leaves opposite, reduced to small lobes at apex of jointed succulent articles. Thyrse spike-like, terminal, cylindrical, consisting of triads of flowers in the axil of each bract; bracts opposite, succulent. Flowers sessile, monochlamydeous, bisexual (usually). Perianth 3-lobed, Stamen 1, abaxial; anther exserted, bilocular. Ovary superior, succulent; carpels 2-3; ovules 1; style slender, 2-3-lobed. Fruiting perianth variable. Seed ovoid to circular; testa membraneous or crustaceous.

KEY TO SPECIES:

1. Articles of stems up to 5 mm long, never glaucous; perianth apex rounded to truncate .... *H. halocnemoides*
1. Articles of stems 5-10 mm long, often glaucous; perianth apex dorsiventrally flattened .... *H. indica*

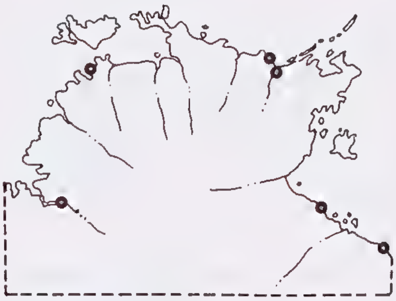
Halosarcia halocnemoides (Nees) Paul G. Wilson

DERIVATION: The Greek "halos" (salt) and "cnema" (internode) refer to the succulent stems.

Spreading or erect shrub to 50 cm high; branchlets slender. Articles narrowly barrel-shaped, 5 x 2 mm, dull to glossy, entire. Spikes almost cylindrical, 10-25(-70) mm long; articles circular or compressed. Flowers free, exposed at apex. Perianth succulent, apex truncate or rounded, lateral lobes prominent, abaxial lobe small and within lateral lobes. Fruiting perianth soft or chartaceous; pericarp thin. Seed discoid or suborbicular, 1 mm long; tuberculate over embryo; reddish-brown. Fruitlets eventually breaking away from the axis.

HABITAT: *H. halocnemoides* occurs in coastal and inland habitats. In coastal situations it occurs at the rear of mangals or on salt pans within, and behind, mangrove zones.

DISTRIBUTION: *H. halocnemoides* is known from three areas in the N.T., this appears to be a reflection of undercollecting rather than real distribution. This species also occurs in Western Australia, South Australia and Queensland.



Halosarcia indica (Willd.) Paul G. Wilson

DERIVATION: The Latin "indica" pertains to India, where this species was first collected.

Shrub, perennial, decumbent to erect. Articles cylindrical to obovoid 5-10 mm long, often glaucous, entire or ciliolate. Spike smooth, cylindrical or ovoid, 2-4 cm long. Flowers coalesent or free, enclosed or with apex exposed; apex rounded or obtuse. Perianth thin or fleshy; lateral

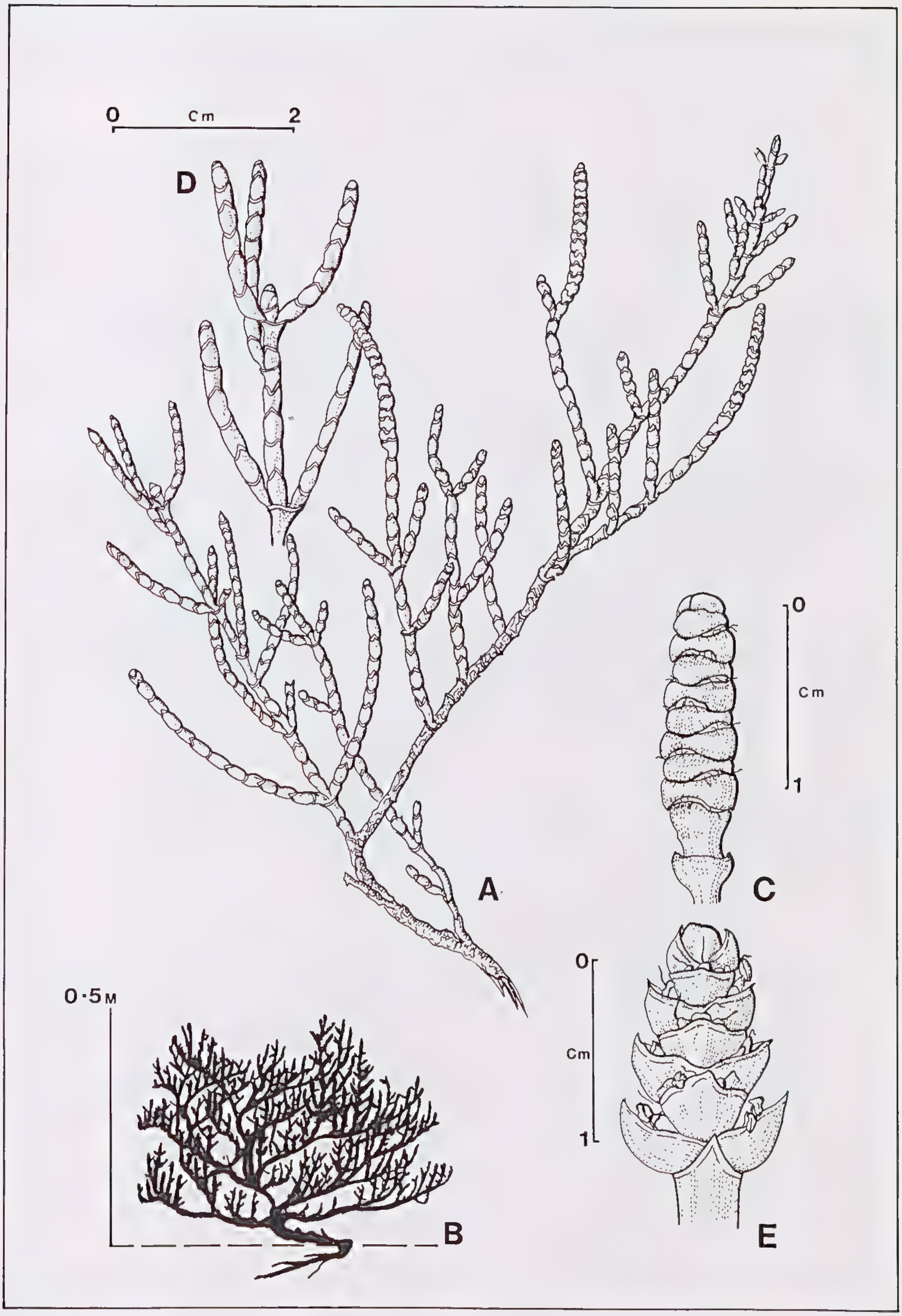
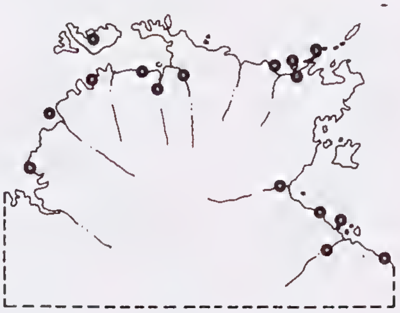


Figure 23. ***Halosarcia***. A-C, *H. halocnemoides*. A, flowering branch; B, habit; C, inflorescence (A-C, P. Bridgewater s.n. DNA 27940). D-E, *H. indica*. D, part of branch; E, inflorescence (E-H, G. Wightman 2466, DNA).

lobes large; abaxial lobes within laterals, minute or equal to laterals. Fruiting spike leathery, corky or spongy, breaking up when mature. Fruitlets laterally compressed; perianth soft; pericarp hard, horny. Seed ovate to circular; testa membranous, pale brown.

HABITAT: *H. indica* occurs in coastal and inland enviroments and prefers sandy substrates with a high salt content, in mangrove communities it is regularly found toward the landward margin. This species may occur in association with *H. halocnemoides*, or as a monospecific groundcover.

DISTRIBUTION: *H. indica* is widespread across the NT coast, and also occurs in Western Australia, Queensland, South Australia, New South Wales and Victoria. Extra Australian occurrences include Malaysia and countries bordering the Indian ocean.



NOTES: Wilson (1984) notes that *H. indica* "is a very variable taxon", he named four subspecies which represented "the more obvious of numerous variants, all of which integrate with one another". In this case *H. indica* is treated as one taxon, though three of the four subspecies named by Wilson (1984) occur in the N.T.

Material of *H. halconemoides* from the N.T. coastal region is referable to *H. halocnemoides* ssp. *tenuis* Paul G. Wilson.

H. indica is fertile from May to November. *H. halocnemoides* is fertile from April to August.

The succulent, salty stems of *Halosarcia* spp. are grazed by cattle and are reputed to be edible (P. Pender, pers. comm.).

In the past these species have been known as *Arthrocnemum indica* and *A. halocnemoides*. *Halosarcia indica* has also been referred to as *Salicornia indica*.

References: Wilson 1980, 1984.

HIBISCUS L. MALVACEAE

DERIVATION: The Greek "hibiskos" was the name of a Malvaceous plant known to Dioscorides and Pliny.

A genus of over 250 mainly tropical species, 35 species occur in Australia, 21 in the N.T.; one, *H. tiliaceus*, often occurs in tidal areas of the N.T.

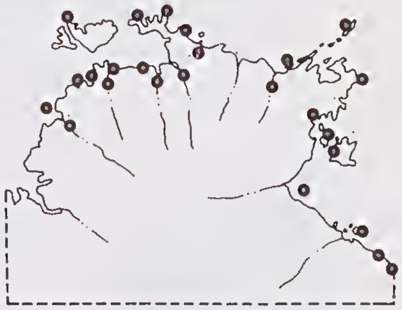
Hibicus tiliaceus L.

DERIVATION: The Latin "tiliaceus" refers to a resemblance to the genus *Tilia.*

Tree, spreading, to 8 m high; bark grey-brown, mottled, smooth; indumentum stellate. Leaves spirally arranged, simple, entire; lamina orbicular, 7.5-15 x 7.5-14.5 cm; coriaceous, bifacial; underside pale, densely tomentose, with nectaries on main veins near petiole, upperside sparsely tomentose or glabrous; nervation palmate; petiole 4-11.5 cm long, apex curved, tomentose; stipules caducous, ovate 1.7-2.5 x 0.8-1.3 cm, nervation parallel. Flowers actinomorphic bisexual, axillary, solitary; pedicel robust, 2.5 cm long. Epicalyx cuplike, 10 mm long; lobes 8-11, triangular, 3-4 mm long, acute. Calyx campanulate, lobes 5, narrowly triangular, 1.9 x 0.7 (at base) cm, exterior densely tomemtose, apex acuminate. Corolla yellow with dark purple centre, lobes 5, obovate, 4.0-5.1 x 2.0-2.5 cm, apex rounded. Stamens many, monadelphous, staminal column antheriferous throughout; filaments 1-2 mm long; anthers 1-1.5 mm. Ovary globose, 5 angled; locules 10; ovules 3-many; style 5-branched, glandular, hairy and purple; stigmas capitate. Capsule globose, 2 cm diameter, densely tomentose; dehiscing into 5 segments. Seeds 5-7 per cell, reniform, 4-5 mm long, black-brown, covered in small reddish warts.

HABITAT: *H. tiliaceus* is most often observed above the high tide mark on sandy beaches and monsoon forest formations, it also regularly grows below the high tide mark and forms an integral part of mangal vegetation. Sandy substrates are preferred. Associates include *Avicennia marina, Lumnitzera racemosa, Thespesia populneoides* and *Xylocarpus mekongensis.*

DISTRIBUTION: *H. tiliaceus* is widespread and common across the N.T. coast, and extends through Queensland to New South Wales. Extra Australian distribution is pantropical.



NOTES: Aboriginals use *H. tiliaceus* on Groote Eylandt as follows, 1, wood is used for woomeras, light spears, firesticks and splints; 2, inner bark is used medicinally to treat boils and headaches; 3, the plant is also a totem of a local clan. Medicinal and cordage uses are also reported (Lassack and McCarthy 1983, Cribb and Cribb 1981). N. Smith (pers.comm.) reports medicinal and carving uses.

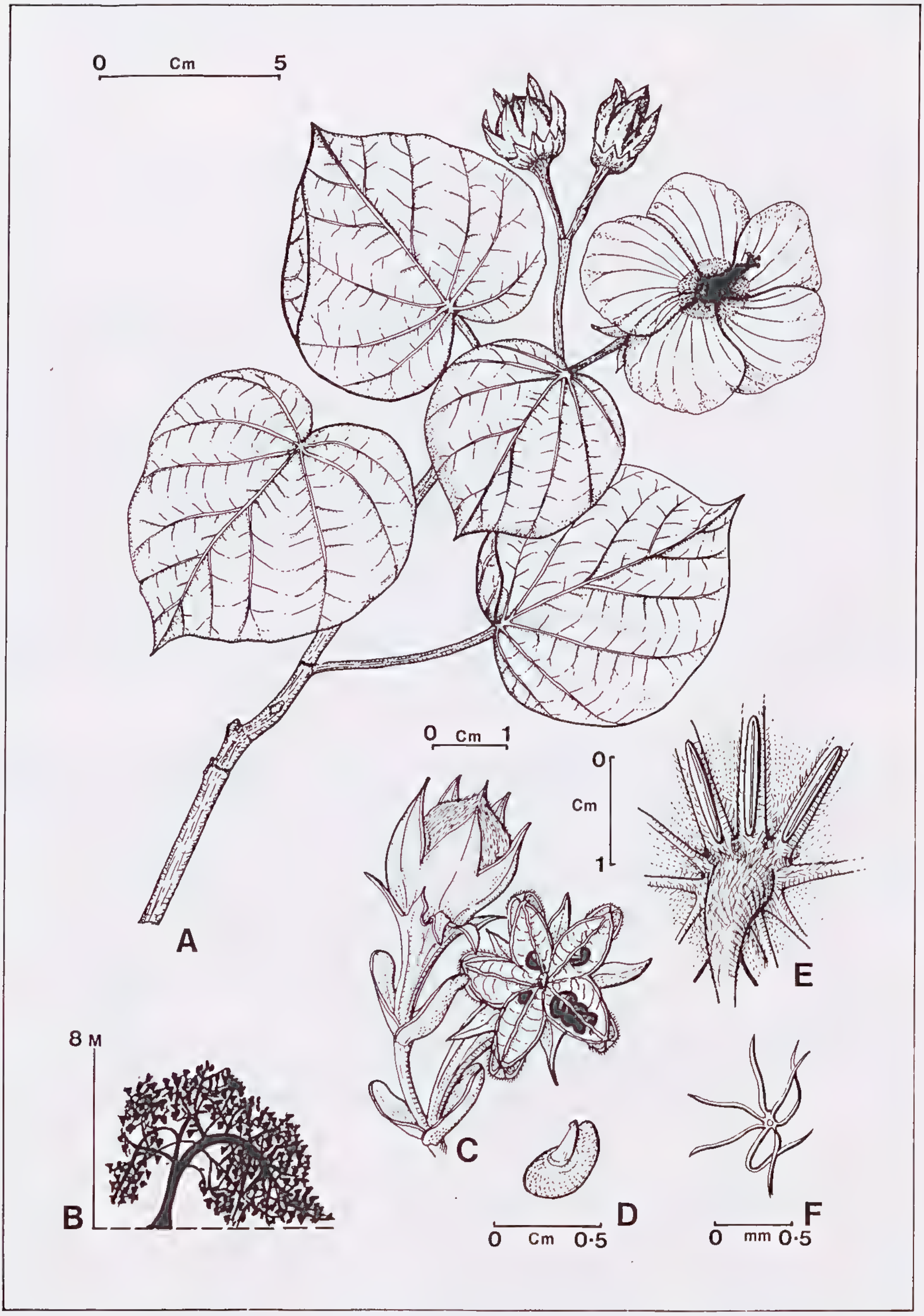


Figure 24. ***Hibiscus tiliaceus***. A, flowering and fruiting branch; B, habit; C, fruit; D, seed; E, domatia; F, hair (A-F, J. Must 1379 & M. Rankin 1452, DNA).

Borassum Waalkes (1966) recognised 5 subspecies of *H. tiliaceus*, all N.T. material examined is referrable to *H. tiliaceus* ssp. *tiliaceus*.

The seed of *H. tiliaceus* is bouyant due to an air cavity, and is capable of germination after saltwater immersion (Borassum Waalkes 1966). Flowers and fruit are produced year round.

References: Borassum Waalkes 1966.

LUMNITZERA Willd. COMBRETACEAE

DERIVATION: In honour of Stefan Lumnitzer (1750-1806), botanist.

A genus of three species, two of which occur in the N.T.; the third species, *L. rosea*, considered to be of hybrid origin, is not known from the N.T.

DESCRIPTION: Evergreen shrubs or small trees, bark very dark to black, longitudinally fissured. Leaves spirally arranged, clumped toward end of twigs, slightly fleshy, coriaceous, marginal and terminal glands inconspicuous. Flowers actinomorphic, bisexual, 5-merous. Calyx tube elongated, bearing two persistent bracteoles. Stamens 5-10, anthers versatile, 0.5 mm long. Ovary inferior, unilocular, ovules 2-5, pendulous, anatropous; style slender; stigma small, simple. Pseudocarp flattened, ellipsoidal, striated, 10-15 x 3-5 mm, bracteoles persistent.

KEY TO SPECIES:

1. Flowers red, inflorescences terminal, fruit slightly compressed ....*L. littorea*
1. Flowers white, inflorescences axillary, fruit distinctly compressed ....*L. racemosa*

Lumnitzera littorea (Jack.) Voight

DERIVATION: The Latin "littoreus" (seashore) refers to the coastal habitat of this species.

Tree, spreading, 5-9 m, pneumatophores slender, knee rounded or retuse, base cuneate, petiole 0-5 mm long. Flowers strongly scented and nectariferous, pedicel 3 mm long. Calyx tube slightly compressed, 8-12 mm long, bearing 2 ovate bracteoles, 1 mm long, calyx lobes ovate, 1 mm long, apex blunt. Corolla lobes 4-6 x 1.5-2 mm, elliptic, apex broadly acute. Stamens 5-10, filaments 9-10 mm long. Style 10 mm long. Pseudocarp slightly compressed, 9-10 mm x 4-5 mm, ellipsoidal, somewhat corky.

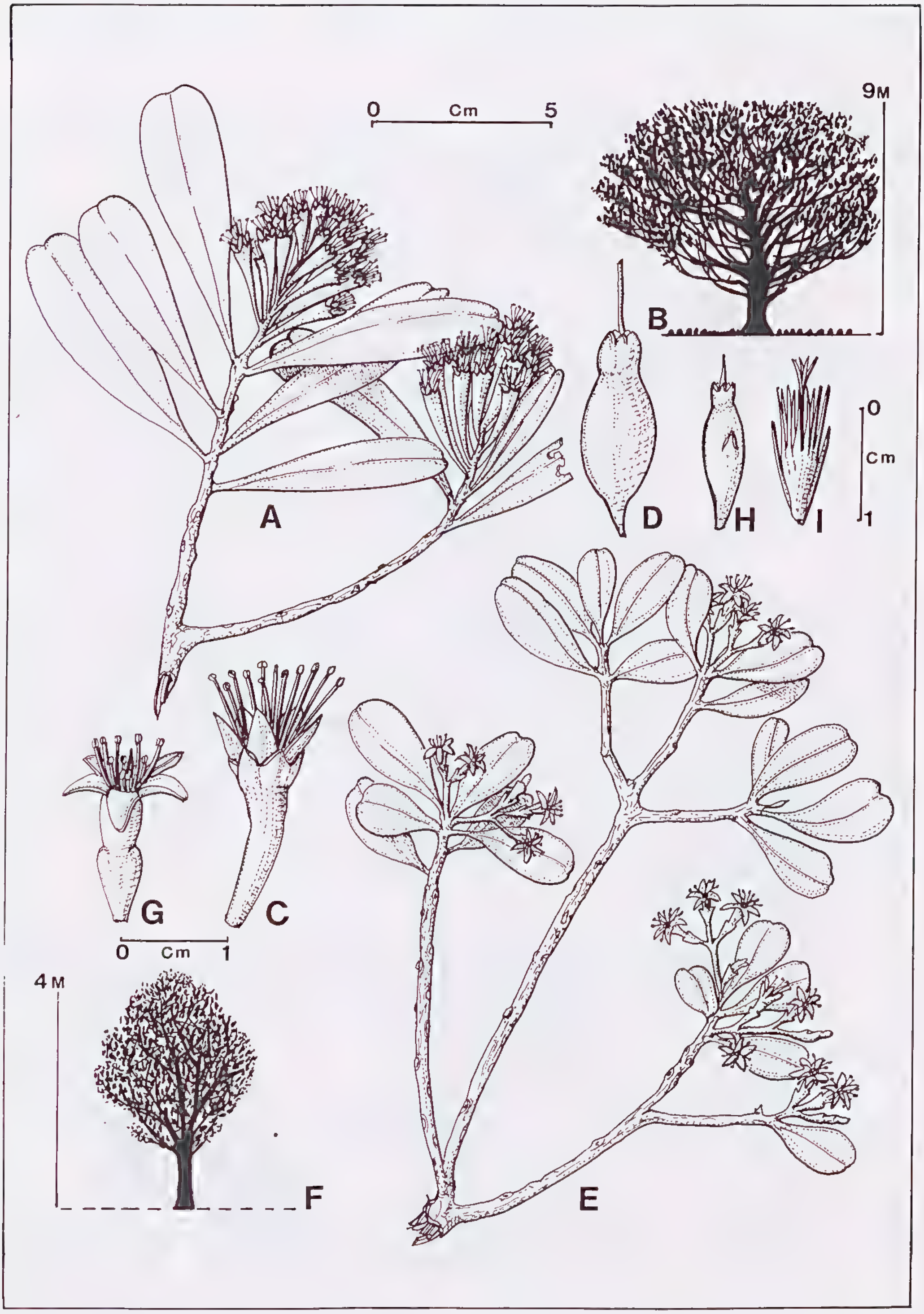
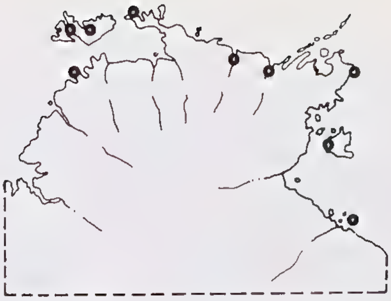


Figure 25. ***Lumnitzera***. A-D, *L. littorea*. A, flowering branch; B, habit; C, flower; D, fruit (A-D, G. Wightman 211, DNA). E-I, *L. racemosa*. E, flowering branch; F, habit; G, flower; H, fruit; I, partially decomposed fruit (E-I, G. Wightman 826, DNA).

DISTRIBUTION: *L. littorea* occurs sporadically across the N.T. coastline and also occurs in Queensland. Extra Australian distribution includes tropical Asia, Malaysia and Polynesia.



NOTES: Nectar production, flower color, inflorescence morphology and location suggest bird pollination. The corky, bouyant fruit of *L. littorea* is well suited to water dispersal. Flower production is poorly known, records exist for February, June, July, September, October and December. Fruit set is similar.

L. littorea prefers a soft muddy substrate at the landward edge of the mangrove zone, where tidal inundation is rare. *Scyphiphora hydrophylacea* is a common associate in this enviroment. *L. littorea* also occurs fringing waterways with a strong perennial freshwater flux. Associates in this enviroment include *Rhizophora apiculata, Bruguiera gymnorrhiza* and *Xylocarpus granatum.*

In Malaysia, the timber of is valued for its extreme durability (wood is reportedly sound after 50 years submersion in salt water). A rose-like fragrance and attractive appearance enhance its suitability as a cabinet timber (Watson 1928, Exell 1954). Maiden (1889) reports various uses of the timber in Fiji. Children in Yirrkala utilize the nectar rich flowers as sweets (pers. obs.).

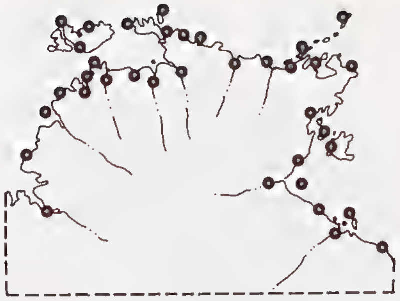
Lumnitzera racemosa Willd.

DERIVATION: The Latin "racemosus" is an apparently inaccurate reference to inflorescence structure.

DESCRIPTION: Shrub or small tree to 4-5 m, pneumatophores absent. Leaves obovate, 2.2-9.7 x 1-2.5 cm, apex retuse, base cuneate; petiole 0-10 mm long. Flowers weakly scented and nectariferous, sessile. Calyx tube strongly compressed, 6-8 mm long, bearing 2 broadly ovate bracteoles, 1.5 mm long, calyx lobes broadly ovate, 1 mm long, apex acuminate, gland tipped. Corolla lobes 4 x 2 mm, elliptic, apex acute. Stamens 10, filaments 4 mm long. Style 5 mm long. Fruit distinctly compressed 10-12 x 3-4 mm ellipsoidal, fibrous, woody.

HABITAT: *L. racemosa* forms the landward fringe of many N.T. mangal formations. A substrate of consolidated mud is preferred. This species also occurs along the margins of waterways with a fresh water influence. Associates include *Ceriops tagal* var. *australis, Excoecaria ovalis, Avicennia marina* and *Aegialitis annulata.*

DISTRIBUTION: *L. racemosa* is widespread and common across the N.T. coastline, extending its range to Western Australia and Queensland. Extra Australian distribution includes Malaysia, eastern tropical Africa, Madagascar, Papua New Guinea and Indonesia.



NOTES: The white, slightly scented and nectariferous flowers are suited to insect pollination. The fibrous fruit are suited to water dispersal. Flower and fruit production occur from October to May and January to June, respectively.

Two varieties of *Lumnitzera racemosa* are recognised: The widespread, white flowered typical variety *racemosa*, and the yellow flowered, Timor endemic *L. racemosa* var. *lutea* (Gaud.) Exell.

References: Byrnes 1977, Exell 1954.

LYSIANA Tieghem LORANTHACEAE

DERIVATION: The Greek "lyo" (I set free), alluding to separation of this genus from *Loranthus*.

An endemic Australian genus of eight species, three of which occur in the N.T. *Lysiana maritima* has only been recorded parasitising *Excoecaria ovalis* in the N.T. Barlow (1964) considers *Lysiana* the most advanced Loranthaceous genus.

Lysiana maritima (Barlow) Barlow

DERIVATION: The Latin "maritimus" (sea) refers to the coastal habitat of this species.

Aerial stem parastic shrub, spreading to erect. Leaves opposite, flat; lamina obovate to spathulate, 2.0-4.0 x 1.2-2.0 cm, apex rounded, base attenuate, venation distinct; petiole obscure, 2-4 mm long. Umbell axillary, 2-flowered; peduncle 2-5 mm long; pedicel 4-8 mm long; bracts 2 mm long, rounded, concave. Calyx 1 mm long, teeth 6, short. Corolla 30-45 mm long, 6 lobed; lobes united into curved tube to middle or higher. Stamens 6, epipetalous, equal; anthers basifixed, introrse, 4 locular, acute. Ovary inferior, locules obscure, ovules undifferentiated; style and stigma simple, style articulate. Fruit baccate, ellipsiodal, 8-10 mm long, somewhat translucent. Seed 1.

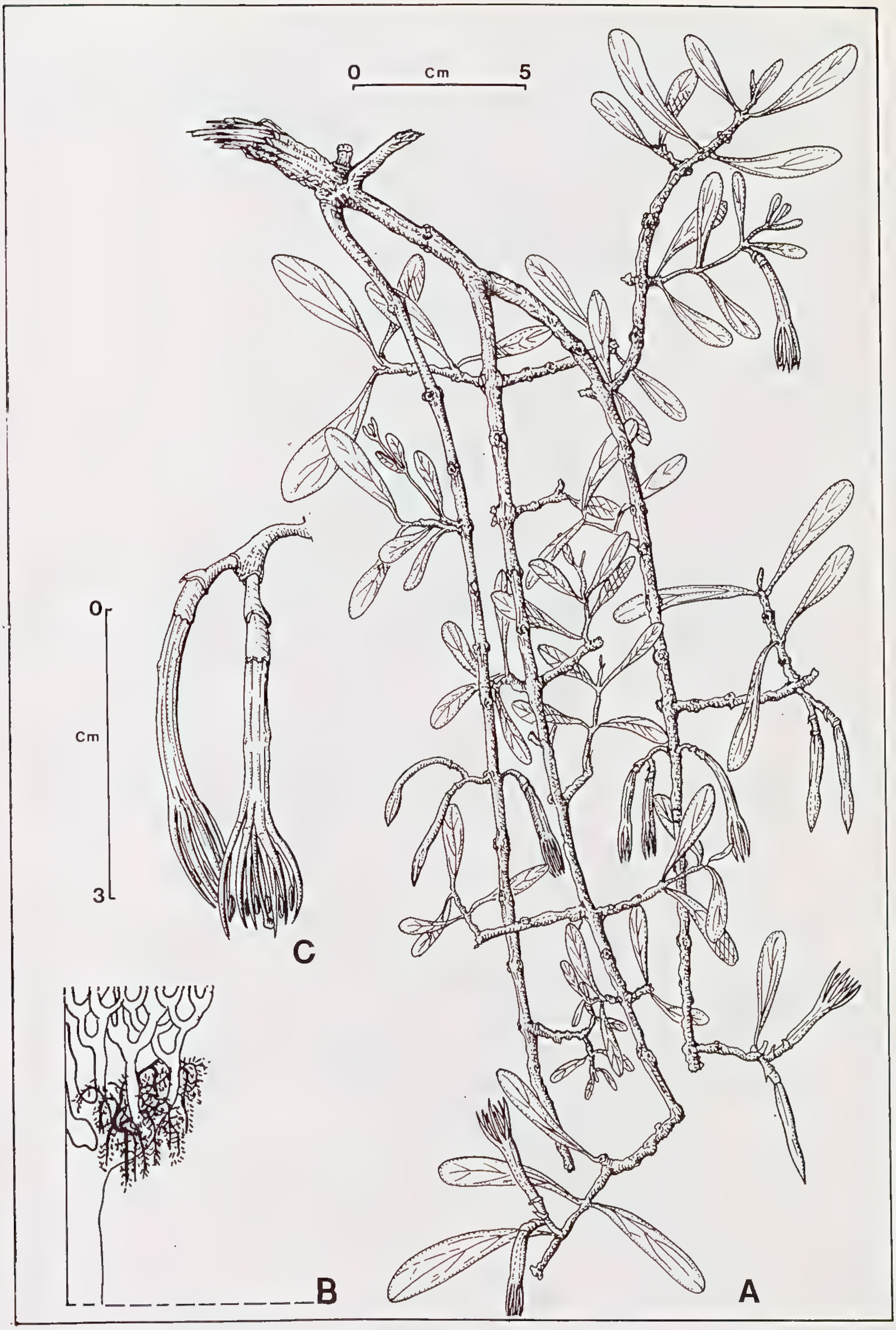
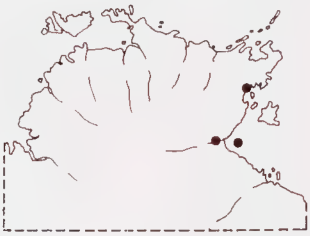


Figure 26. ***Lysiana maritama***. A, flowering branch; B, habit; C, flower (A-C, G. Wightman 4083).

HABITAT: *L. maritima* has only been recorded parasitising *Excoecaria ovalis* in the N.T., records from Queensland show that other mangroves (*Rhizophora* and *Ceriops*) and rarely adjoining non-mangrove vegetation may also be parasitized (Barlow 1964, 1982, 1984). Host plants of *Excoecaria ovalis* occupy rear mangal situations, bordering open saline sand flats.

DISTRIBUTION: *L. maritima* has only been recorded from the Gulf of Carpentaria region. This species also occurs in Queensland, and is endemic in Australia.



NOTES: *L. maritima* is closely related to *L. subfalcata*, in the past it was considered a subspecies of *L. subfalcata* (Barlow 1966).

Flowering specimens of *L. maritima* have been collected in June, July and November, fruit have not been observed in N.T. populations. Primack *et al.* (1981) note that the flowers of *L. maritima* display several factors related to bird pollination, and observed White throated honey-eaters (*Melithreptus albogelaris*) as being principal visitors and pollinators. The interaction between mistletoes and mistletoe birds (*Dicaeum hirundinaceum*) has been disscussed previously (*Amyema* spp.).

Previously *L. maritima* has been considered endemic to Queensland (Barlow 1966, 1984), however recent collections and redetermination of older collections, have extended the range of *L. maritima* to the eastern coast of the N.T.

References: Barlow 1966, 1984.

NYPA Wurmb. *ARECACEAE*

DERIVATION: From "Nipa" the traditional name used by Moluccans.

A monotypic genus it is considered to represent an independent line of specialization in the Arecaceae, and was placed in a monotypic group, the Nypoid palms, by Moore (1973).

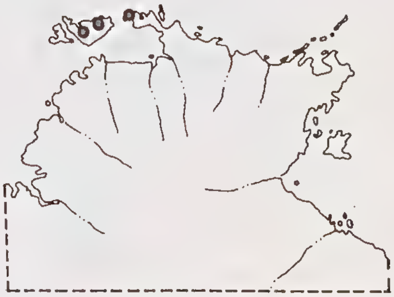
Nypa fruticans Wurmb.

DERIVATION: The Latin "fruticans" (shrubby) refers to the habit of this species.

Palm, clumping; stems subteranean, robust, prostrate, forking, rooting from lower surface. Fronds pinnate, erect, slightly recurved, 4-9 m long; petiole 1-1.4 m long, stout, strongly flanged at base. Pinnae 100-120 per leaf, 60-130 x 5-8 cm, upper surface shiny green, lower surface somewhat powdery, midrib regularly marked by linear, brown, medifixed scales to 2 cm long. Inflorescence borne on peduncle 1-2 m long, arising from stem; female flowers in spherical head 25 cm diameter; male flowers in catkins below. Fruiting body spherical, 45 cm diameter, individual fruit obovate, angular, fibrous, 10-15 x 5-8 cm. Seed one per fruit, egg-shaped, white, 5 x 4 cm.

HABITAT: *N. fruticans* is found on soft, fine grained substrates fringing the upper limits of tidal waterways, a perennially high input of freshwater is required. Northern Territory populations occur on strongly flowing perennial waterways, where salinity is low all year round. Associates include *Xylocarpus granatum*, *Rhizophora apiculata*, *Lumnitzera littorea*, and *Dalbergia candenatensis*.

DISTRIBUTION: *N. fruticans* is known from three localities in the N.T., two on Melville Island, the third on Cobourg Peninsula. This species also occurs on the north-east Queensland coast, extra Australian distribution includes the Philippines, Malaysia, New Guinea, south east Asia and the western Pacific.



NOTES: Aboriginals of the Herbert River area collected and ate unripe seeds (Elliot & Jones 1984). In Asia, sap is collected from *N. fruticans* and is used in the production of alcohol and, to a lesser extent, sugar and vinegar (Watson 1928). Fronds of *N. fruticans* are used for thatching, umbrellas, hats, mats, baskets and cigarette papers, the fruit have also been utilised as a food source, after preparation, petiole fibres are used to produce rope, brooms and brushes (Watson 1928).

The pollen is sticky and pollination appears to occur via drosophilial flies (Essig 1973). Uhl and Moore (1977) note that vasculature, histology and growth patterns of flowers support this mode of pollination. The fruit of *N. fruticans* are fibrous and air cavities in the seed testa and fruit coat aid water dispersal, however Guppy (1906) reports that the fruit remain viable for only short periods in salt water. Van der Pijl (1969) hesitates to accept that *N. fruticans* is viviparous, however Saenger (1982) considers *N. fruticans* viviparous.

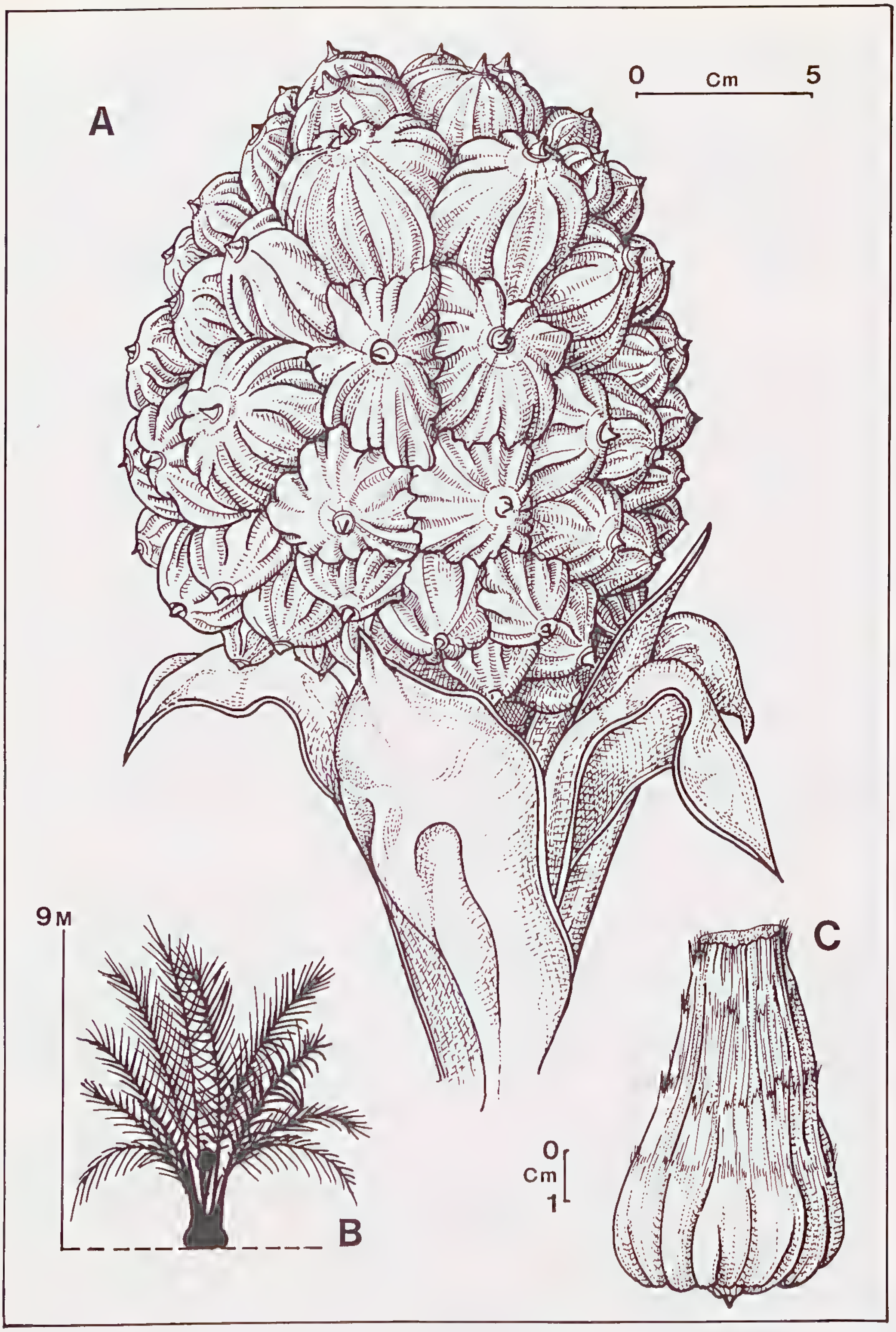


Figure 27. ***Nypa fruticans***. A, fruiting head; B, habit; C, single fruit (A-C, J. Waldeck s.n., DNA 10662).

Cronquist (1981) notes *Nypa* pollen in the fossil record from the upper cretaceous, 65-70 million years B.P. *Nypa* would have been well represented in the Australian flora in the early tertiary period (Barlow 1981), pollen is recorded from the sediments of Perth and London.

Flowers occur in November & December while fruits have been observed in October, November and December. Further field studies are needed to document *N. fruticans* phenology in the N.T.

References: Covacevich 1981.

OSBORNIA F. Muell. MYRTACEAE

DERIVATION: In honour of J.W. Osborne, a chemist who investigated Myrtaceous oils for Ferdinand von Mueller.

A monotypic genus, *Osbornia* has recently been transferred from subfamily Leptospermoideae to Myrtoideae, though it may not belong in either traditional subfamily (Johnson and Briggs 1983).

Osbornia octodonta F. Muell.

DERIVATION: The Latin "octo" (eight) and "donta" (tooth) refer to the eight lobed calyx of this species.

DESCRIPTION: Shrub, columnar or multistemmed to 6m; bark fibrous, stringy, grey or brown, twigs white-grey, smooth. Leaves opposite, simple, entire or crenulate; lamina obovate, 3.1-5.2 x 1.4-2.1 cm, marked by small translucent oil glands, apex rounded or emarginate, base cuneate; petiole swollen, 2 mm long. Inflorescence 1-3 flowered, axillary, subtended by 2 caducous, elliptic, 6 mm long bracteoles; peduncle 5 mm long. Flowers sessile, subtended by 2 deltoid, pubescent, 3 mm long bracts. Calyx and hypanthium sericous, tube turbinate, 3-4 mm long; lobes 8, obovate, 2-3 mm long. Corolla lacking. Stamens numerous; filaments 4-5 mm long; anthers versatile, broadly elliptic 0.5 mm long. Ovary inferior, unilocular, ovules numerous, placentation basal peltate; style robust, 5-6 mm long, pilose at base; stigma scarcely differentiated. Fruit indehiscent, enclosed by calyx tube, calyx lobes and style persistent. Seeds 1-2, obovate, 7 x 5 mm, flat.

HABITAT: *O. octodonta* occurs toward the rear of mangrove communities or fringing tidal waterways. Associates include *Avicennia marina*, *Aegiceras corniculatum* and *Ceriops tagal*. *O.*

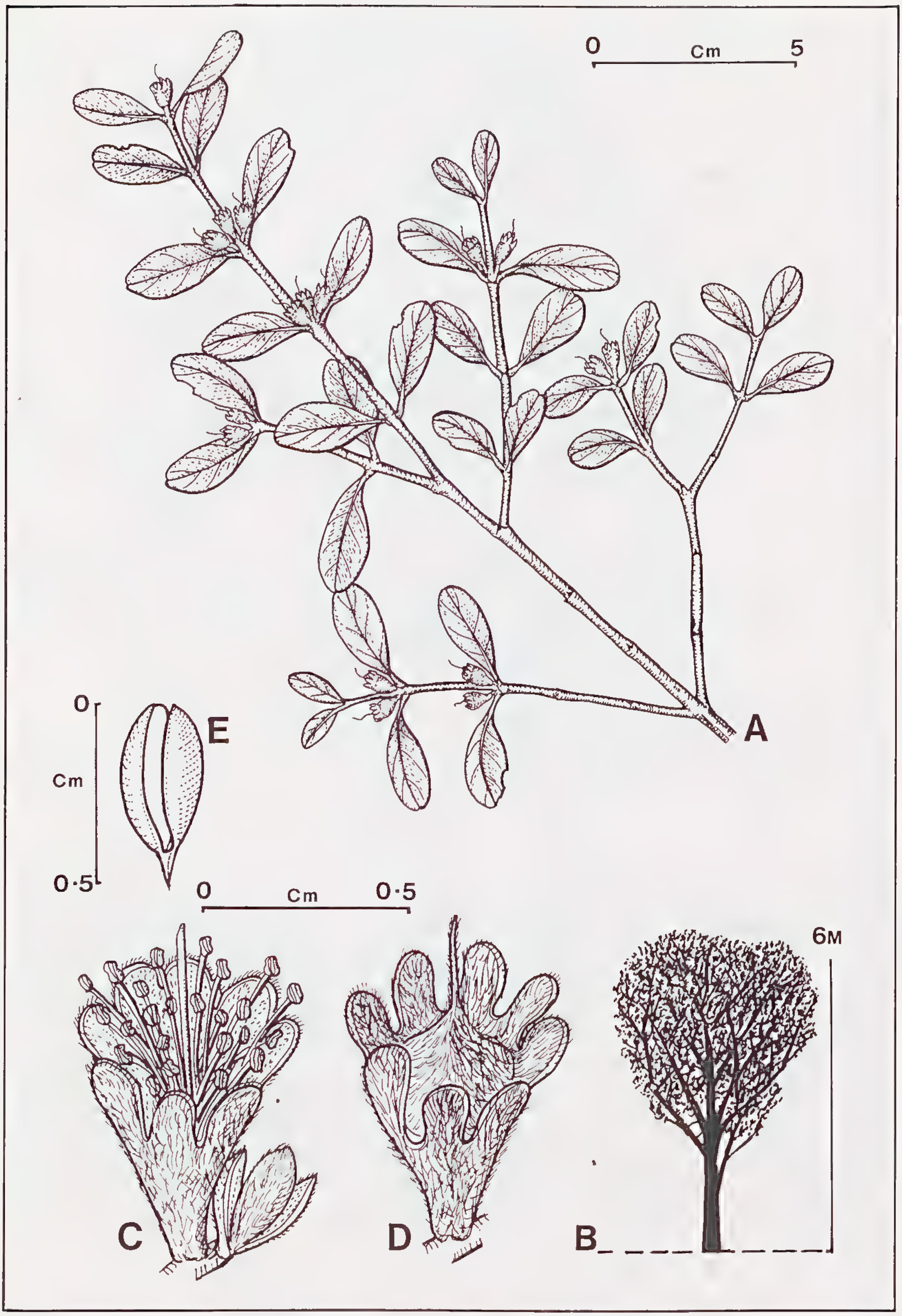
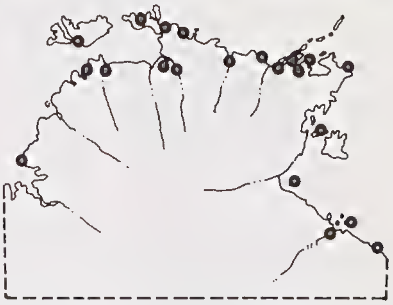


Figure 28. ***Osbornia octodonta***. A, flowering branch; B, habit; C, flower; D, fruit; E, seed (A-E, G. Wightman 968, DNA).

octodonta appears to be nonspecific to substrate and is found on soft mud, rock, sand and calcareous dune formations, however it is absent from areas frequently flooded by fresh water.

DISTRIBUTION: *O. octodonta* is widespread across the N.T. coastline, and also occurs in Western Australia and Queensland. Extra Australian distribution includes Indonesia, New Guinea and the Philippines.



NOTES: Watson (1971) notes fishermen using the crushed leaves as insect repellant. Aboriginals use heated branchlets to allay toothache and as insect repellant (pers. obs.).

Larger plants of *O. octodonta* have a fluted stem. Leaves and petioles of some plants are tinged red. West Australian populations have crenulate leaf margins, N.T. specimens portray entire and crenulate leaf margins.

Buds and flowers are produced from June to December and peak in November. Fruit occur in February. The indehiscent fruit of *O. octodonta* is suited to water dispersal by its close tomentum (which traps air) and its bouyancy. The small, aromatic, flowers, with silvery indumentum and exserted stamens are insect pollinated (Tomlinson 1986).

PEMPHIS Forster & Forster f. LYTHRACEAE

DERIVATION: The Greek "pemphis" (swelling) refers to the swollen fruit.

A genus of two species, one endemic to Madagascar, the other, *P. acidula*, widespread in the old world tropics, including tidal areas of the N.T.

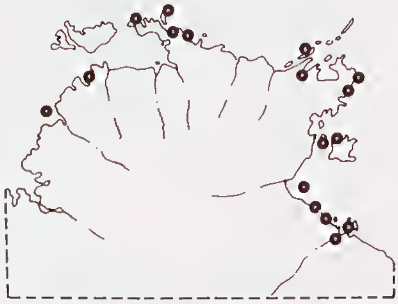
Pemphis acidula Forster & Forster f.

DERIVATION: The Latin "acidula" means a little sour, application uncertain.

Shrub or small tree to 4 m, often spreading and diffuse to 1 m; bark light grey, fissured in older specimens. Leaves decussate, simple, entire; lamina ovate to obovate, occasionally fleshy and suborbicular, 9-20 x 4-8 mm, apex acute, base cuneate, both surfaces with short tomentum; petiole 1-2 mm long. Flowers solitary, axillary, bisexual, 6-merous; pedicel 5-10 mm long, erect. Calyx base tubular, tomentose, 12-angled, 6-8 mm long, sepals persistent, triangular, 1 mm long, with subulate accessory lobes alternating in sinuses. Petals crumpled, obovate, 6 x 5 mm, white, inserted at apex of hypanthum alternating with sepals. Stamens 12, in 2 series; filament 2-4 mm long; anthers dorsifixed, 1 mm long. Ovary superior, globular 2.0 mm diameter, unilocular, ovules numerous; style simple, persistent; stigma capitate. Capsule spherical 4-5 mm diameter, enveloped by persistent calyx; dehiscence circumscissile. Seeds 10-20, circular, flattened, margin corky.

HABITAT: *P. acidula* occurs at the landward margin of tidal vegetation, at or above the high tide limit, substrates include sand, laterite, limestone and gravel. Often rock outcrops above normal tidal influences are colonised.

DISTRIBUTION: *P. acidula* is widespread across the N.T. coast and also occurs in Western Australia and Queensland. Extra Australian localities include Africa, south east Asia and Polynesia.



NOTES: Aboriginals on Groote Eylandt use *P. acidula* as follows; 1, digging sticks are manufactured from branches 1 m long, the strong hard wood is particularly effective for yam digging; 2, as a tooth ache cure, a twig is heated in sand and thrust into the offending tooth; 3, as woomera pegs; and 4, as shade trees on the beach (Levitt 1981).

Flowers and fruits are produced year round, though peak fertility occurs from June to December. Native bees visit and appear to pollinate flowers (pers.obs.). The corky margin of the seed aids bouyancy and hence water dispersal.

P. acidula shows a marked degree of variation depending upon habitat. Habit varies from low, spreading shrubs to tall, almost columnar trees, leaves vary from sub-orbicular, small and fleshy to larger, obovate and non fleshy.

Two morphologicaly different flowers are produced by *P. acidula* (Tomlinson 1986). They are traditionally referred to as "pin" and "thrum". An examination of Northern Territory material shows that pin (short styled, i.e. 1 mm long, where the stamens enclose the stigma) flowers are far more common than thrum (long styled, i.e. 3-4 mm long, where the stamens exceed the stigma) flowers. Tomlinson (1986) and Lewis and Rao (1971) both provide useful accounts of this phenomenon.

References: Lewis & Rao 1971.

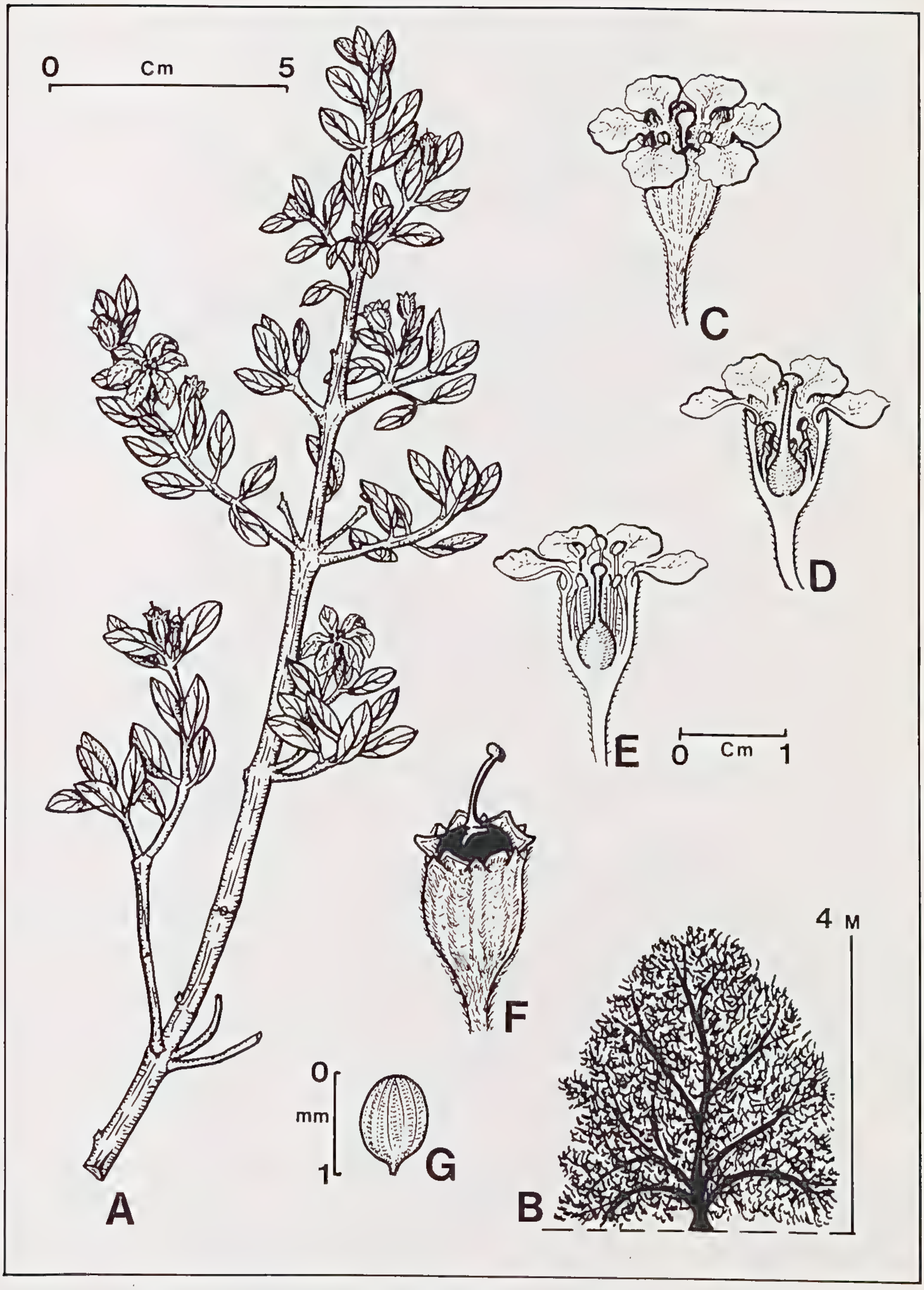


Figure 29. ***Pemphis acidula***. A, flowering and fruiting branch; B, habit; C, flower; D, dissected pin flower; E, dissected thrum flower; F, fruit; G, seed (A-D, N. Byrnes 2360, DNA; E-G, C. Dunlop 5187, DNA).

DERIVATION: The Greek "rhiza" (root) and "phora" (bearing) refer to the characteristic stilt roots of the genus.

A pantropical genus of eight or nine species, four species occur in Australia, three of these in the N.T. One taxon, *R. lamarckii*, is considered to be of hybrid origin.

Trees, viviparous; stilt roots arching, conspicuous. Leaves decussate, simple, entire, glabrous, elliptic to ovate, midrib extending to caducous point; stipules lanceolate. Inflorescence axillary, cymose; bracts and bracteoles at flower base and inflorescence dichotomies. Sepals 4, persistent, reflexed in fruit. Petals 4, entire. Stamens 4-12; anthers almost sessile, triangular. Ovary semi inferior, united with hypanthium, locules 2, ovules 2 per locule. Fruit obpyriform. Fertile seeds one per fruit. Hypocotyl cylindrical, up to 40 cm long.

KEY TO SPECIES:

1. Inflorescence with 3 dichotomies; style > 5 mm long;
underside of leaf evenly dotted .... *R. stylosa*
1. Inflorescence with 1 or 2 dichotomies; style < 3 mm long;
underside of leaf not evenly dotted 2

2. Inflorescence with 1 dichotomy; peduncle
< 14 mm long .... *R. apiculata*
2. Inflorescence with 2 dichotomies; peduncle
> 18 mm long .... *R. lamarckii*

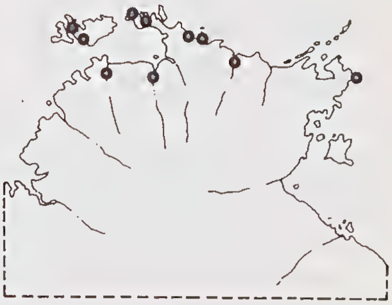
Rhizophora apiculata Blume

DERIVATION: The Latin "apiculata" (to end abruptly) is thought to be a reference to the apex of the leaf.

Tree, columnar to 15 m; bark dark grey, tessellate; stilt roots extending to 3 m up stem. Leaves narrowly elliptic, 9.3-19.0 x 3.7-8.0 cm, lamina dark green with distinct light green zone along midrib; apex mucronate, base attenuate; petiole 17-35 mm long; stipules 4.0-7.1 cm long. Inflorescence 2 flowered. Buds broadly ellipsoidal, finely fissured, subtended by 2 fused cup-shaped, fissured, bulbous bracteoles. Calyx lobes concave, ovate, 11-15 x 5-6 mm, acute. Corolla lobes oblong-lanceolate, 9-10 mm long, membranous. Stamens 11-12; anther 8-10 mm long, sessile. Upper ovary bluntly conical, 2 mm high; style 0.8 mm long, 2-lobed. Fruit 3.0-3.5 x 1.5-2.1 cm, rough. Hypocotyl cylindrical, club shaped, 18-37 x 1.2-1.9 cm.

HABITAT: *R. apiculata* grows in mud and sand substrates; tidal waterways with a strong freshwater input on a perennial basis are preferred. Associates include *Bruguiera gymnorrhiza, Lumnitzera littorea, Rhizophora stylosa* and *R. lamarckii.*

DISTRIBUTION: *R. apiculata* is sparsely distributed across the northern coast of the N.T.. Due to its habit of occurring as isolated trees or as small stands it is likely to be found in more localities in the future. *R. apiculata* also occurs in Queensland, extra Australian range is from Sri Lanka to the Pacific Islands.



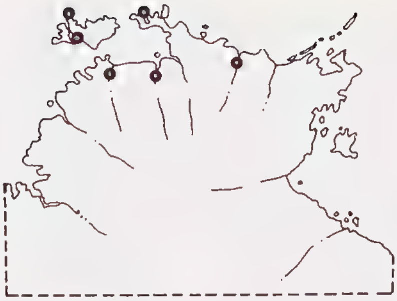
Rhizophora lamarckii Montr.

DERIVATION: In honor of Jean Baptiste Antoine Pierre de Monnet de Lamarck (1744-1829), biologist.

DESCRIPTION: Tree, rambling, multitrunked, robust to 25 m; bark from grey, finely tessellated to dark grey, coarsely friable; stilt roots gregarious to 6 m, up trunk. Leaves elliptic, 9.1-13.6 x 3.9-6.3 cm, apex with distinct apicle to 3 mm long, base broadly cuneate; petiole 1.5-2.5 cm long; stipule lanceolate, 5-7 cm long. Inflorescence with 2 dichotomous branches, each dichotomy subtended by 2 opposite, fused bracteoles. Peduncle 1.8-2.1 cm long, flattened; pedicel stout to 4 mm long. Bud narrowly ovate 1.0-1.2 cm long, subtended by opposite fused bracteoles. Calyx lobes deltoid to broadly lanceolate, 9-14 x 6-8 mm, apex acute. Corolla lobes lanceolate, 10 x 3 mm, margins tomentose, apex acute. Stamen number variable; anthers almost sessile, 8 mm long. Ovary shallowly conical; style 2 mm long, terete, 2-4 lobed. Fruit have not been observed in N.T. populations.

HABITAT: *R. lamarckii* is restricted to mangal areas with a perennial source of freshwater input, substrates of sand and mud may be colonised. Associates include *Bruguiera gymnorrhiza, Lumnitzera littorea, Ceriops decandra* and less commonly *Nypa fruticans* and *Xylocarpus granatum.* Obligate associates in the N.T. are *R. apiculata* and *R. stylosa.*

DISTRIBUTION: *R. lamarckii* is known from five localities in the N.T., and also occurs in north east Queensland. Extra Australian records include Sri Lanka, New Guinea, Indonesia and New Caledonia.



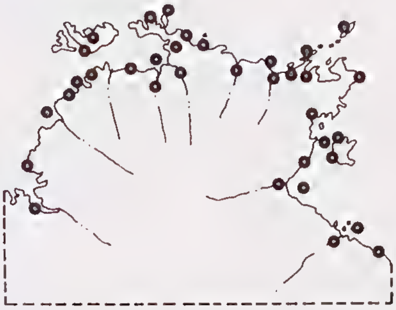
Rhizophora stylosa Griffith

DERIVATION: The Latin "stylosus" refers to the large style of this species.

DESCRIPTION: Tree, multitrunked or columnar, to 10 m; bark smooth, grey to fissured, black; stilt roots to 3 m, aerial roots copious from lower branches. Leaf blade broadly elliptic, 6.5-12.0 x 3.3-7.4 cm, under-surface regularly spotted, apicle prominent to 4 mm long, base broadly cuneate; petiole 1.2-3.1 cm long. stipule lanceolate, 23.9-5.8 cm long. Inflorescence with 3-5 dichotomies, up to 32 flowered; each dichotomy subtended by a 4 lobed bract. Calyx lobes broadly lanceolate, 9-13 x 3-4 mm, apex acute. Corolla lobes lanceolate 9-11 mm long, margins woolly, hairs 3-4 mm long. Stamens 4-8; anthers 8-9 mm long, almost sessile. Ovary depressed-conical, 1.5 mm high; style 6 mm long, terete-filiform, apex bilobed. Fruit 2.6-3.2 x 1.7-2.0 cm, neck distinctly contracted. Hypocotyl cylindric, 20-35 x 1.1-2.0 cm.

HABITAT: *R. stylosa* grows in a variety of tidal habitats, preferring banks of tidal rivers, but also as a pioneering species in coastal situations or as a landward zone at the rear of tidal forests. *R. stylosa* may be found in association with many species that occur in tidal areas. Substrates include muds, sands, coarse grits and rock.

DISTRIBUTION: *R. stylosa* is widespread across the N.T. coastline, and also occurs in Western Australia and Queensland. Extra Australian occurrences include Taiwan, Malaysia, the Phillipines, Indonesia and New Guinea.



NOTES: ***Rhizophora* spp.**

Some confusion has existed in the past over the number of species of *Rhizophora* that occur in the N.T. Due to misidentification of herbarium specimens some authors have listed *R. mucronata* as occurring in the N.T. (eg. McCusker 1984, Lassak and McCarthy 1983).

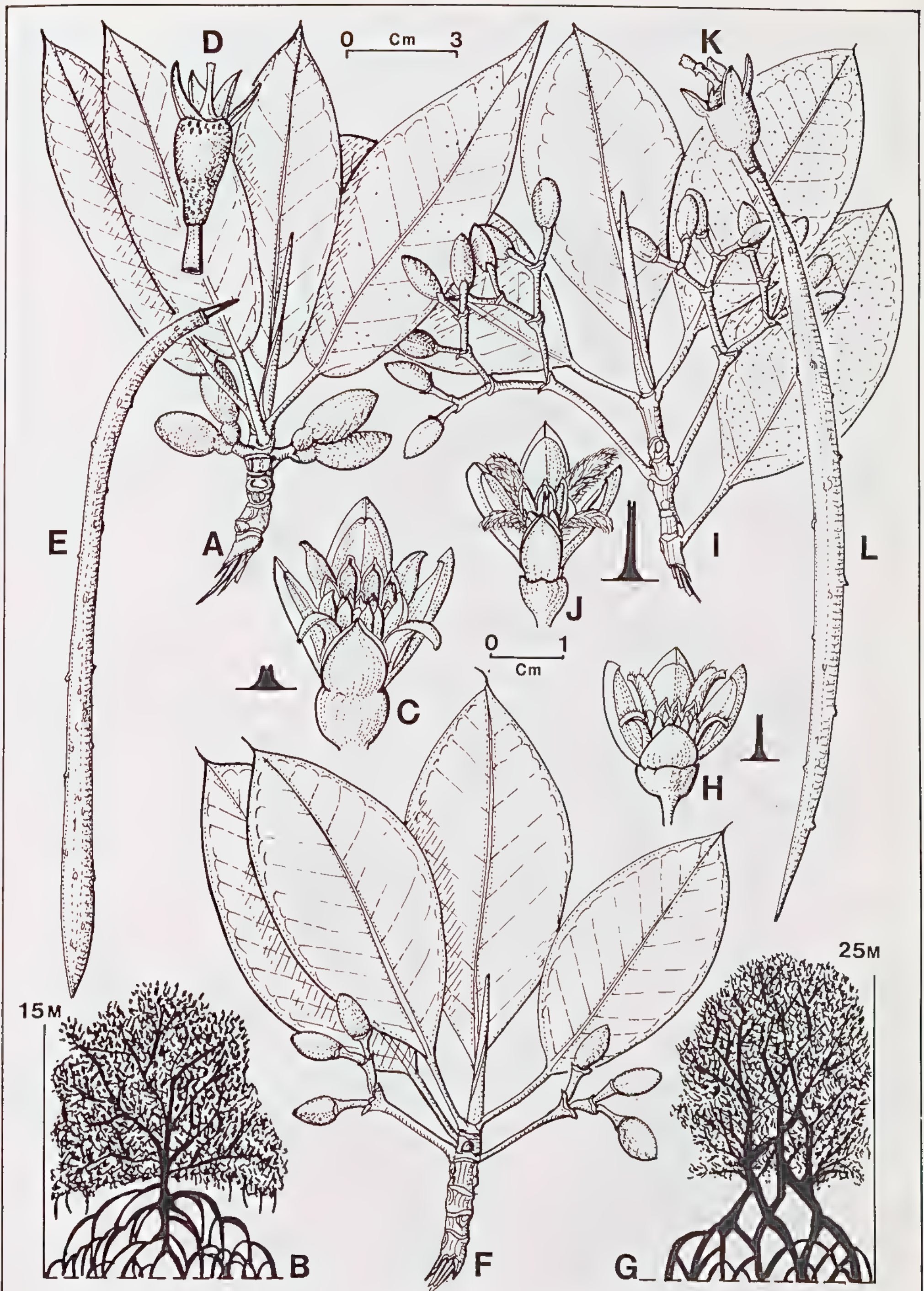


Figure 30. ***Rhizophora***. A-E, *R. apiculata*. A, budding branch; B, habit; C, flower and style; D, fruit; E, hypocotyl (A-E, C. Dunlop 6840, DNA). F-H, *R. lamarckii*. F, budding branch; G, habit; H, flower and style (F-H, G. Wightman 2101, DNA). I-L, *R. stylosa*. I, budding branch; J, flower and style; K, fruit; L, hypocotyl (I-L, G. Wightman 477, DNA).

R. stylosa is used by Dampierland Aboriginals to make boomerangs, spears and ceremonial objects, the wood is also regarded as good firewood (Smith & Kalotas 1985). Specht (1958) also records clubs being made from the buttress roots (mistakenly as *R. mucronata*) in Arnhem Land. The bark of *Rhizophora* spp. has also been used for tanning and dyes (Cribb & Cribb 1981). In Malaysia, Watson (1928) reports light wine and a decoction used to cure haematuria made from the fruit.

The hybrid origin of *Rhizophora lamarckii* has been suggested in the past (Tomlinson 1978, Tomlinson and Womersley 1976). Sterility, intermediate floral morphology and aberrant stamen numbers have supported the theory. Although Duke & Bunt (1979) are sceptical about the hybrid origin of *R. lamarckii* in Queensland, field evidence from N.T. populations is supportive of hybrid origin. Three populations of *R. lamarckii* are known in the N.T., all are co-occurrent with *R. stylosa* and *R. apiculata*, no fruit have been seen on any individuals. Further *R. lamarckii* is morphologically intermediate between the two putative parents, while aberrant stamen numbers are commonplace.

R. stylosa produces flowers and fruit throughout the year. *R. apiculata* has been recorded flowering from June to February, and fruiting from June to November. *R. lamackii* has been recorded with buds and flowers in June and August. Tomlinson (1986) suggests all *Rhizophoras* are wind pollinated, he cites high pollen/ovule ratios, short pollen presentation time, lack of nectar secretion and downward pointing flowers (so that foliage does not obstruct pollen dispersal) as evidence to support wind pollination.

References: Ding Hou 1958, Duke & Bunt 1979, McCusker 1984.

SCYPHIPHORA Gaertn. f. RUBIACEAE

DERIVATION: From the Greek "skyphos" (cup) and "phoros" (bearing) refers to the cup like flowers.

A monotypic genus isolated within the Rubiaceae, *Scyphiphora* is included in the Cinchonideae-Gardiineae-Gardenieae, but is distinguished by a suite of important characters.

Scyphiphora hydrophylacea Gaertn. f.

DERIVATION: A reference to this species resemblance to the genus *Hydrophylum*.

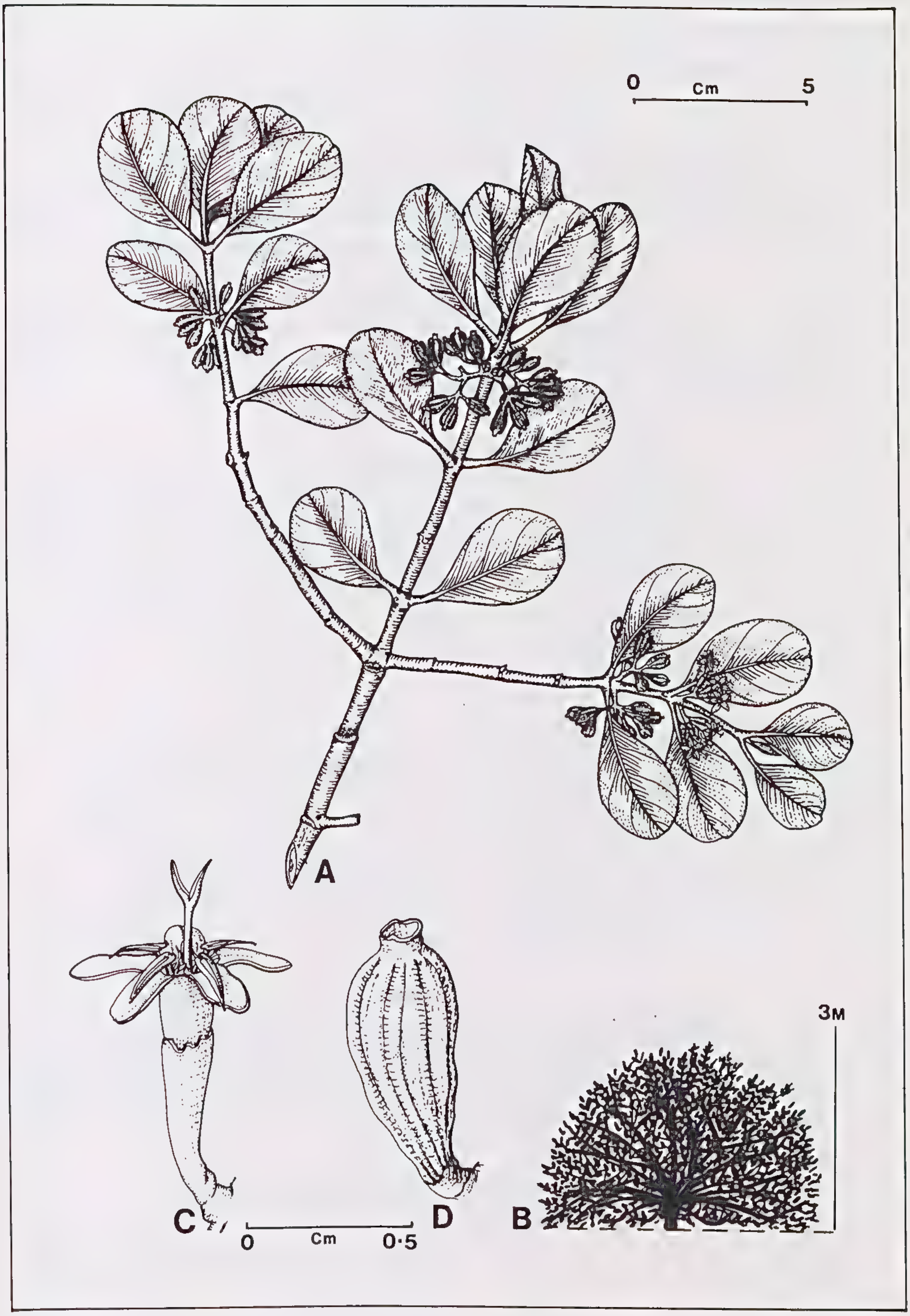
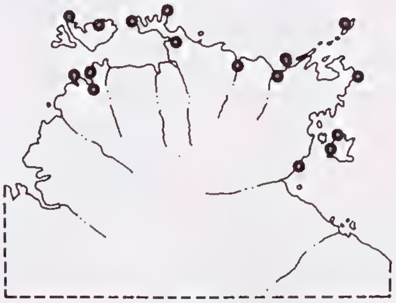


Figure 31. ***Scyphiphora hydrophylacea.*** A, flowering and fruiting branch; B, habit; C, flower;;D, fruit (A-D, G. Wightman 378, DNA).

Spreading shrub to 3-5 m; glabrous; bark rough, brown; prop roots occasionally present in larger specimens; young shoots resinous. Leaves simple, entire, opposite; stipules connate, forming an interpetiolar, ciliate, sheath, 2 mm long; petiole slender to 13 mm long; lamina obovate, coriaceous, 2.5-4.5 x 4.5-7.1 cm, apex rounded, base cunneate. Inflorescence a dense axillary cyme, peduncle to 15 mm long. Flowers bisexual zygomorphic, subsessile, 4-partite. Calyx tube turbinate, 5 mm long; limb cup-shaped, 1 mm long, crowned by 4 minute teeth. Corolla tube cylindric, 2 mm long, orifice hirsute; lobescontorted in bud, at maturity broadly elliptic, 2 x 2.5 mm, apex rounded. Stamen filaments 1 mm long, adnate and alternate to base of corolla lobes; anthers dorsifixed, dithecal, lanceolate, 1.5 mm long, apex acuminate, base sagitate. Ovary inferior, locules 2, ovules 2-per locule, style filiform, 1.5 mm long; stigma lobes 2, 1 mm long, erect. Capsule indehiscent, cylindrical, 8 mm long, longitudinally 8 ribbed, calyx persistent, endocarp corky. Seeds 4, cylindrical, 1 x 2 mm.

HABITAT: *S. hydrophylacea* has been observed on mud, sand and rock substrates at the landward margin of mangrove zones or on the banks of tidal waterways. It appears intolerant of lengthy periods of freshwater inundation and usually occupies sites that are frequently inundated by tide (Wells 1981). Common associates include *Avicennia marina, Ceriops tagal* and *Lumnitzera racemosa.* Wells (1981) comments that *S. hydrophylacea* occurs on sites unsuitable for colonisation by other mangrove species.

DISTRIBUTION: *S. hydrophylacea* occurs sporadically across the N.T. coast, within this range occurrence is patchy. This species also occurs in Western Australia and Queensland, extra Australian occurrences include India, Sri Lanka, Malaysia, Indonesia and New Guinea.



NOTES: Jones (1971) reports *S. hydrophylacea* to be the true yamstick of Aboriginals and also notes this species to be worth cultivating as a border in saline areas. The durable timber is used for fence posts and tool handles in Malaysia, but is too small for other purposes (Watson 1928).

Corolla colour is generally white, however a specimen exhibiting a pink coloration at the neck of the corolla tube has been observed (Dunlop & Wightman 6538, DNA). Petioles and twigs may be reddish in colour on some specimens. The young shoots of *S. hydrophylacea* are strongly resinous.

Flowers are produced from June through December, fruit between July and January. Flowers may be insect or self pollinated, nectar is produced by a glandular disc at the base of the corolla (Tomlinson 1986). Fruit set is very high, but seed germination is relatively low. The fruit is well adapted to water dispersal because of the corky and bouyant capsule wall (Guppy 1906).

Manila reportedly takes its name from the vernacular name, "nilar", of *S. hydrophylacea*, Manila literally translates to the place where nilar grows. Blanco used this name as the specific epithet when he incorrectly placed this species in the genus *Ixora*.

SESUVIUM L. AIZ0ACEAE

DERIVATION: Possibly in reference to the "Sesuvii", a Gallic tribe which lived in Roman Gaul.

A genus of six species, one a Galapagos Island endemic, four from the Angolan region, and *S. portulacastrum*, a pan tropical littoral plant that occurs in N.T. tidal areas.

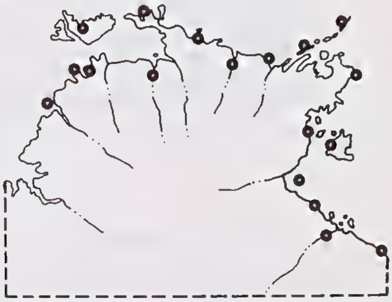
Sesuvium portulacastrum (L.) L.

DERIVATION: Refers to this species resemblance to the genus *Portulaca*.

Spreading or prostrate perennial herb, succulent, glabrous; stems smooth, rooting at nodes, to 1 m long. Leaves opposite, linear, lanceolate or oblanceolate, fleshy, 25-70 x 5-15 mm, apex blunt, base connate. Flowers axillary, solitary; pedicels 3-15 mm long. Perianth tube 3 mm long; lobes 5, triangular, 6-9 mm long, margins scarious; dorsal mucro behind apex 1.5 mm long. Stamens numerous; filament 6 mm long; anther 2-celled. Ovary superior, ovoid; locules 3, ovules 2-10 per locule; placentation axillary; styles 3(-4), 4 mm long. Capsule circumcissile, obovoid, smooth, 8 mm long. Seeds several, pea shaped, 1.5 mm diameter, smooth, black.

HABITAT: *S. portulacastrum* occurs along landward margins of mangals, on mudflats and sand dunes in areas that are irregularly inundated by tide. Substrates of sands and muds are colonised. Associates include *Avicennia marina, Ceriops tagal, Lumnitzera racemosa* and other halophytic coastal plants.

DISTRIBUTION: *S. portulacastrum* is widespread across N.T. coastline. This species also occurs in Western Australia, Queensland and New South Wales, extra Australian distribution is pantropical.



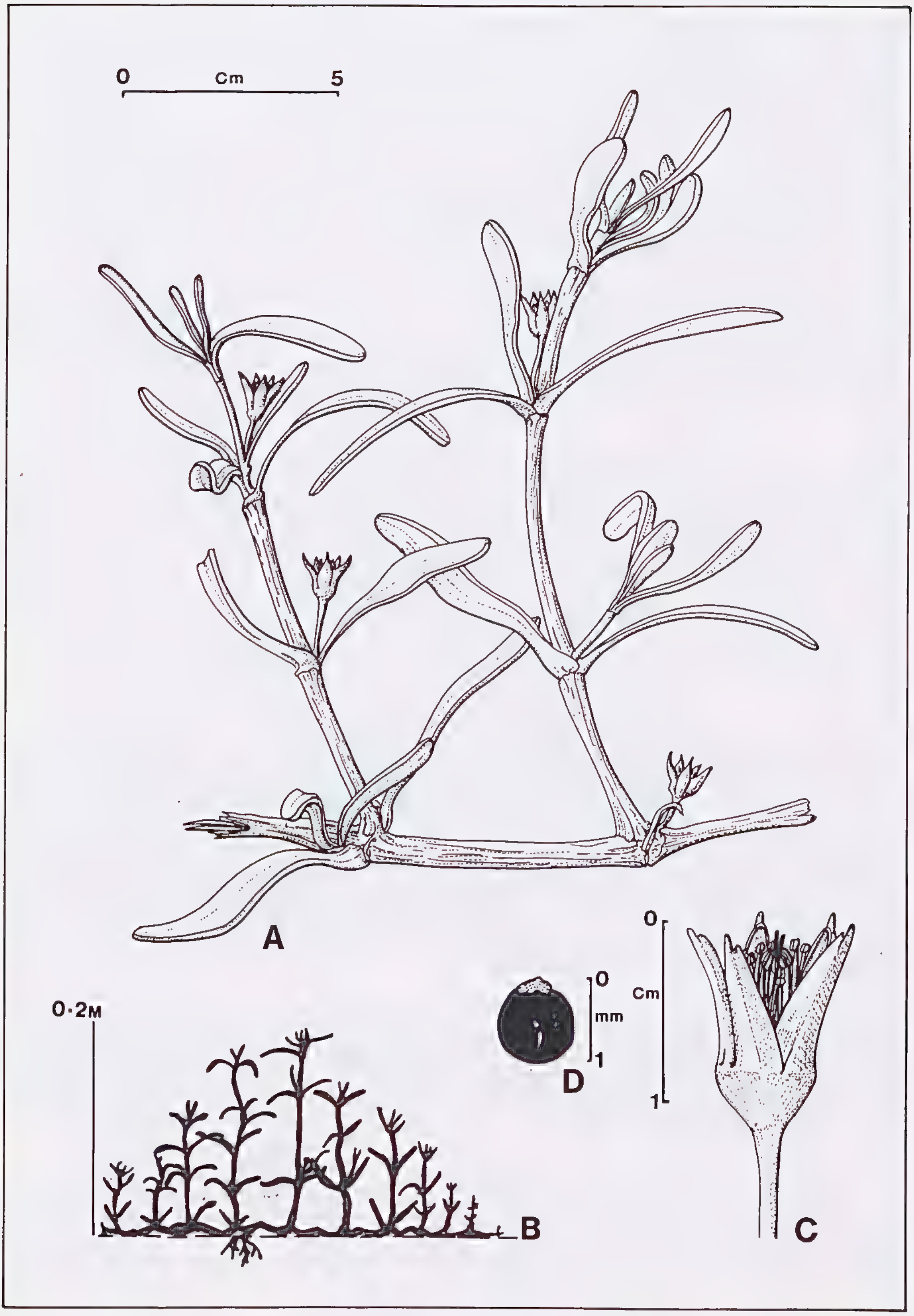


Figure 32. ***Sesuvium portulacastrum***. A, flowering branch; B, habit; C, flower; D, seed (A-D, G. Wightmam 1603 & G. Wightman 3143, DNA).

NOTES: The fleshy leaves of *S. portulacastrum* have been utilised as a food source by Aboriginals (Cribb and Cribb 1981), though repeated washing and cooking is necessary to disperse salt and an unpleaseant aftertaste. Leaf edibility is also reported from Malaysia and Indonesia. Levitt (1981) notes that leaves are used in childrens games on Groote Eylandt, however, no mention is made of a possible food source. This species is reported to have been eaten by Captain James Cook and the crew of the Endeavor, whilst repairs were undertaken at the Endeavor River, Queensland.

Flowers of *S. portulcastrum* have been observed from February to March, fruit set is shortly after flowering, the perianth segments close at night and during cloudy periods. Flowers show strong protandry (Primack *et al.* 1981). Small pollen collecting bees (*Trigona hockingsi* Cockeral) visit flowers of *S. portulacastrum* in Queensland, day flying moths visit flowers in the N.T. The small black seeds of *S. portulacastrum* lack bouyancy (Guppy 1906).

SONNERATIA L.f. SONNERATIACEAE

DERIVATION: In honor of Pierre Sonnerat, 18th Century French explorer and naturalist.

A genus of seven mangrove species, all confined to the tropics of the old world. Represented by three species and three hybrids in Australia, of which the widespread *S. alba*, the restricted *S. lanceolata* and a poorly known hybrid are recorded from the N.T.

Trees, evergreen, bisexual, glabrous; radial cable roots bearing conical pneumatophores. Leaves opposite, biserate, simple, bearing vestigial stipular glands at petiole base, exstipulate, mucro reflexed. Inflorescence terminal on branchlets, 1 flowered. Flowers bisexual, subtended by 2 caducous bracts and 2 ovate bracteoles; hypanthuim campanulate, coriaceous. Sepals valvate, acute, persistent. Stamens many, caducous; filaments filiform; anthers medifexed, reniform, 1.5 mm wide. Ovary superior, locules 12-20, ovules many, placentation axile; style 1, filiform, base persistent; stigma capitate. Berry obpyriform; pericarp indehiscent, subtended by persistent calyx. Seeds many, endosperm lacking.

KEY TO SPECIES:

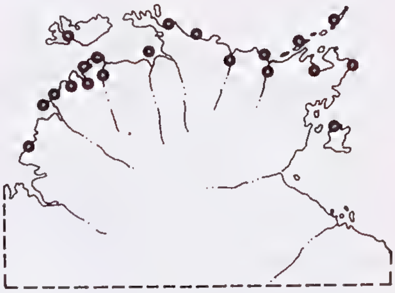
1. Leaves obovate-ovate; fruit apex depressed ....*S. alba*
1. Leaves oblong-lanceolate; fruit apex swollen ....*S. lanceolata*

Sonneratia alba J.Smith

DERIVATION: The Latin “albens” (white), refers to the white stamens of this species.

Tree, spreading, 4-5(-8) m high; bark smooth with fine, longitudinal fissures, cream to brown; penumatophores stout, blunt, 25 cm high. Leaf lamina coriaceous, obovate-ovate, 4.8-10.7 x 2.7-7.5 cm, base attenuate, apex blunt; petiole 6-15 mm long. Peduncle stout, terete, 0-10 mm long; mature bud broadly elliptic, 29 x 19 mm with slight medial constriction, apex blunt. Hypanthium often ribbed. Sepals 6-7, 20-25 mm long. Petals caducous or wanting, linear-spathulate, 20-24 x 1-2 mm, acute, white or red. Berry 4 x 3 cm, apex slightly depressed. Seeds falcate, 12 mm long.

HABITAT: *S. alba* is a pioneering species, intolerant of long periods of exposure to fresh water. Preferred soils are consolidating muds and sands, occasionally rock and gravel are colonised. *S. alba* is frequently found in coastal situations (protected from strong wave action), down-stream estuarine areas and around offshore islands. Associates include *Avicennia marina, Rhizophora stylosa, Camptostemon schultzii* and *Aegialitis annulata.*



DISTRIBUTION: *S. alba* is widely distributed across the northern and western coasts of the N.T.. This species also occurs in Western Australia and Queensland. Extra Australian occurrences include New Guinea, New Caledonia, New Hebrides, the Solomon Islands and through south-west Oceania.

NOTES: Malayan's eat the young, somewhat sour fruit of *S. alba*, produce a haemorrhage checking poultice from the fruit and use the wood for fuel in periods of shortage (Watson 1928). Papuans use the roots of *Sonneratia* spp. for corks and floats (Percival and Womersley 1975). *S. alba* is valued as timber for boat and house construction in the Celebes (Backer and van Steenis 1951).

S. alba produces flowers and fruit at most times of the year, peak fertility occurs from March to October. Duke (unpublished data) notes seasonality in Queensland populations with flowers produced during October November and fruit during February. Flower morphology of *S. alba* minimises self pollination ,though geitonogomous pollination is possible and important in isolated trees and small populations. The flowers are ephemeral and nocturnal (Primack *et al.* 1981), whilst hawk-moths were observed visiting and pollinating flowers birds and fruit bats are also important pollinators (van der Pijl 1969). Primack *et al.* (1981) consider the floral variation of *S. alba* to be a manifestation of variations in available pollination vectors. Fruit bouyancy in *S. alba* is due to the presence of air bearing tissue in the seed test (Guppy 1906).

S. alba exhibits a great deal of morphological variation. While N.T. populations rarely reach 8 m in height, Queensland trees are known to reach 20 m. Examination of N.T. specimens reveals inflorescences with one terminal bud, Duke (pers. comm.) quotes Queensland material as exhibiting 1-5 buds. Within the N.T. *S. alba* flowers may be apetalous, semipetalous or bear 5 caducous petals. Whilst Primack *et al.* (1981) explain this variability via pollination vectors, Duke (pers. comm.) notes a relationship between climatic and habitat factors and petal variation. Petal color may be pale pink, red or green tinged at base. *S. alba* bark varies with age of plant, young trees exhibit smooth, cream to brown bark, with fine longitudinal fissures, older trees have deeply fissured flakey cream bark. The presence of vestigial stipules and caducous bracts is barely mentioned in literature (Cronquist 1981), bracts are lacking in all but the youngest buds. Pneumatophores are absent when *S. alba* occurs on solid substrate.

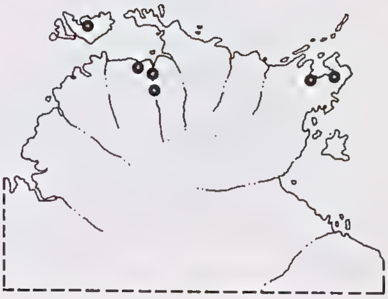
Sonneratia lanceolata Blume

DERIVATION: The Latin "lanceolata" refers to the lanceolate leaves of this species.

Tree, columnar, 7-8(-12) m high; bark smooth with horizontal rings and orange pustules; pneumatophores thin, pointed, to 80 cm high. Leaf lamina oblong-lanceolate, 5.7-16.0 x 2.4-3.8 cm, attenuate, bluntly acute; petiole 3-5 mm. Peduncle stout, tetragonous, sometimes winged, 1-5 mm long; mature bud elliptic 25 x 18 mm, blunt. Hypanthuim smooth. Sepals 5-7, 14-20 mm long. Petals 5-6, linear, 25-30 x 2-4 mm, red. Berry 4.5 x 3.5 cm, apex conical. Seeds angular, 7 mm long.

HABITAT: *S. lanceolata* is a pioneering species restricted to estuarine situations with a high degree of freshwater input. Substrates are usually fine silts or muds deposited on accreting river meanders. *S. lanceolata* may form monospecific stands or associations with *Avicenna marina, A. integra, Aegiceras corniculatum* and *Derris trifoliata.*

DISTRIBUTION: *S. lanceolata* is sporadically distributed across the northern N.T. coastline. Populations are recorded from Melville Island, the Wildman and South Alligator Rivers and rivers entering Arnhem Bay. *S. lanceolata* also occurs in Queensland and the south coast of New Guinea.



NOTES: In Malaysia the young berries, whilst sour, are eaten, wood is used as fuel and pneumatophores furnish an inferior substitute for corks(Backer & van Steenis 1951).

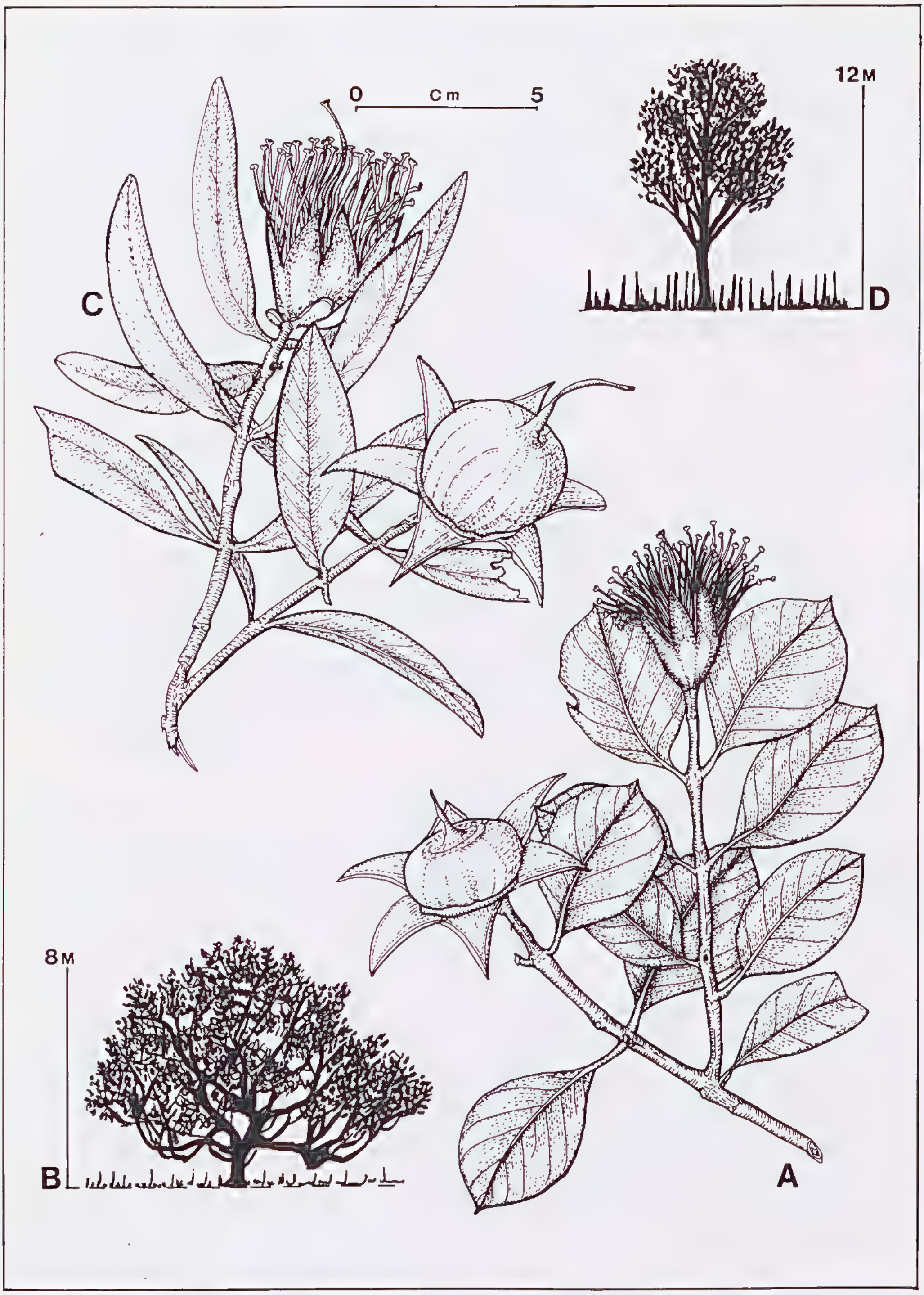


Figure 33. ***Sonneratia.*** A-B, *S. alba.* A, flowering and fruiting branch; B, habit and pneumatophores (A-B, G. Wightman 712, DNA). C-D, *S. lanceolata.* C, flowering and fruiting branch; D, habit and pneumatophores (C-D, M. Lazarides 9233 DNA & G. Wells s.n., DNA 9875).

Northern Territory populations produce flowers from June through October. Fruit are known from June to December. Queensland populations flower in September and October with fruit set most numerous during December to March.

Backer & van Steenis (1951) considered *S. lanceolata* a synonym of *S. caseolaris*, however later work by Duke (1987) allowed these species to be distinguished by leaf and staminal filament characters.

Variation between populations on neighbouring rivers in Queensland has been observed by Duke (pers. comm.), N.T. populations also show spatial variation between disjunct populations. Specimens collected by Wells from the Habgood River (Arnhem Land) exhibit consistently shorter, broader leaves and longer, more lanceolate calyx lobes than specimens from the South Alligator River (Kakadu National Park). An atypical population of *S. lanceolata* on the Wildman River with lanceolate leaves and double petal numbers probably represents an undescibed taxon (Duke, pers.comm.). Further fertile collections are necesary to clarify the situation. *S. lanceolata* also exhibits vestigial stipules and caducous bracts.

A collection of *Sonneratia* from the Goromura River, Arnhem Land (Wells s.n.;DNA 15228), represents a hybrid of *S. lanceolata* and *S. alba* (Duke 1987). Morphological features of this collection are intermediate between the putative parents which co-occur on this river. It is unusual for populations of these species to co-occur as their habitat preferences usually dictate spatial disjunction in the field. Duke (1987) also refers to a West Irian collection which is a hybrid of *S. alba* and *S. lanceolata*.

References: Duke 1987.

SPOROBOLUS R. Br. POACEAE

DERIVATION: The Greek "sporo" (seed) and "bolos" (throwing) refer to the easily shed seed.

A genus of about 100 species, dispersed in tropical regions of the world; in Australia 19 species are represented (four are introduced). Seven species occur in the NT; one , *S. virginicus*, is regularly found in tidal areas.

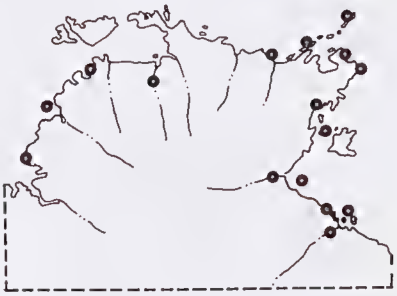
Sporobolus virginicus (L.) Kunth

DERIVATION: From Virginia, USA, where this species is called Virginian drop seed.

Perennial, rhizomatous, creeping, slender, branching; culms erect, to 40 cm high. Leaf sheaths imbricate, orifice hairy; leaf blade flat or involute, tapering to a fine point, conspicuously distichuous, to 5 cm long. Panicle spike-like, dense, contracted, 7.4-10.0 x 0.5-2.5 cm; spikelets often leaden-colored, 2-2.5 mm long, floret single. Glumes subequal, upper slightly longer, narrow lanceolate, keeled, acute, glabrous, strongly 1 nerved. Lemma subequal to glumes, glabrous, shining; palea longer than lemma. Stamens 2-3. Ovary globose; styles free, short; stigmas plumose, laterally exserted. Grain broadly obvoid, pericarp thin.

HABITAT: *S. virginicus* occurs in coastal and inland areas, it regularly occurs in rear mangal situations where it forms dense, low mats. Sandy soils are preferred, as are areas with a high salinity. Associates include *Halosarcia* spp., *Excoecaria ovalis, Lumnitzera racemosa* and *Avicennia marina.*

DISTRIBUTION: *S. virginicus* is widespread across the N.T. coast, it is found in all Australian states. Extra Australian records include Africa, Malesia, the Americas and the Pacific Islands.



NOTES: *S. virginicus* produces fertile culms throughout the year. Buffalo have been observed grazing this mat forming perennial. (Refer to Fig. 17, for drawing of *S. virginicus.*)

Material of *S. virginicus* from coastal areas of the N.T. is all referable to var. *virginicus.*

References: Simon 1982.

SUAEDA Forsskal ex Scop. CHENOPODIACEAE

DERIVATION: From the Arabic traditional name "Suwaida" for *Suaeda aegyptica.*

A genus of over 100 species, the majority of which occur in the Northern Hemisphere. Five species occur in Australia, three are introduced, two are endemic natives. One *S. arbusculoides* occurs around the tropical coastline, including N.T. mangrove communities.

Suaeda arbusculoides L.S. Smith

DERIVATION: The Latin "arbuscula"(small tree) refers to the habit of this species, which is reminiscent of a small tree.

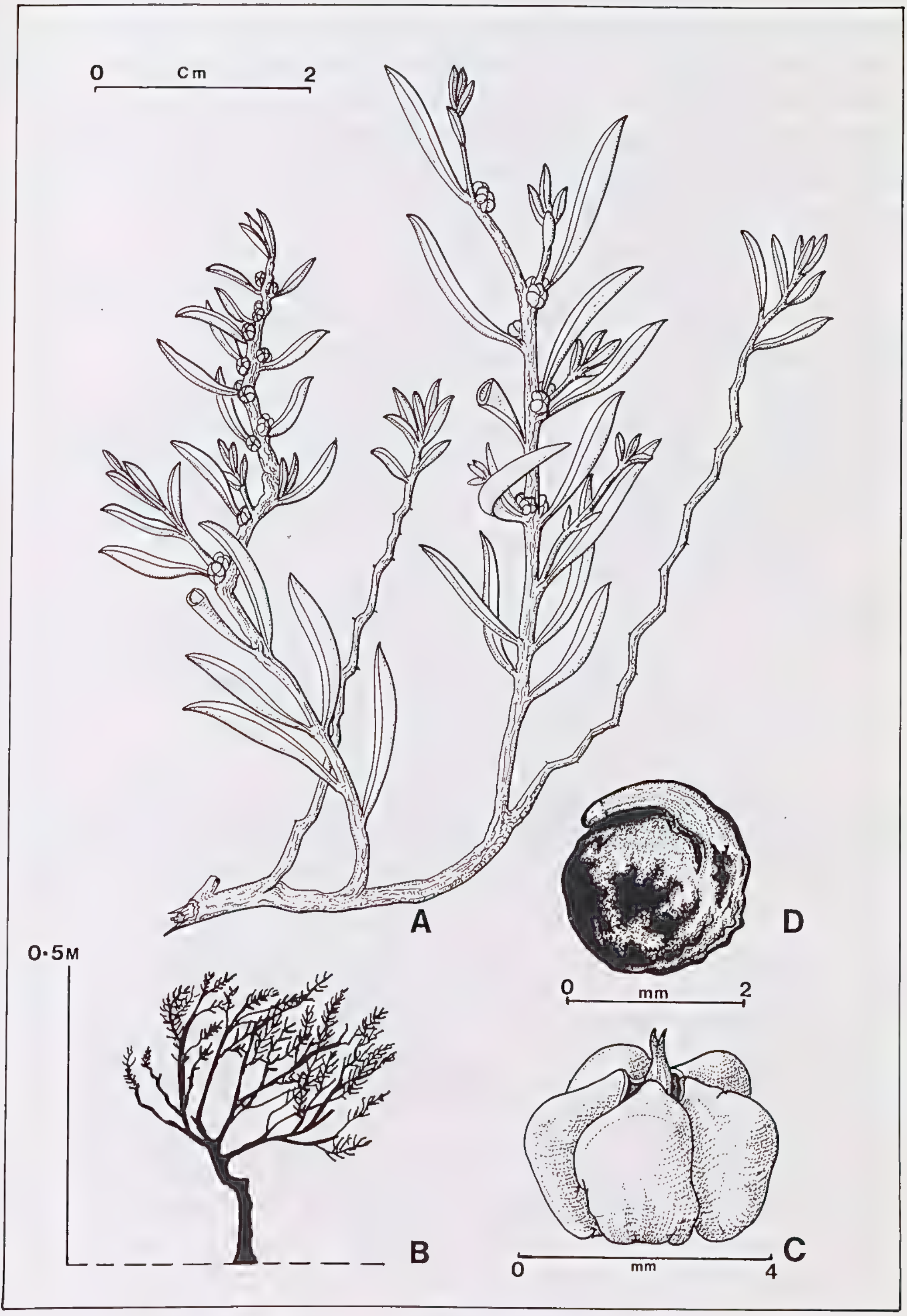
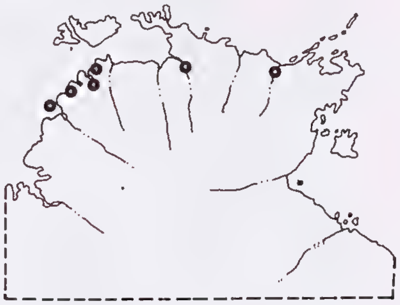


Figure 34. ***Suaeda arbusculoides***. A, fertile branch; B, habit; C, flower; D, seed (A-D, G. Wightman 975 & G. Wightman 3309, DNA).

Erect, woody, subshrub to 0.5 m high; glabrous. Leaves alternate, succulent, oblanceolate or narrowly fusiform, 10-20 x 2-3 mm, apex acute, base cuneate, sessile. Flowers bisexual, in axillary clusters of 1-5; subtended by 2-3 small, scale-like bracteoles. Perianth succulent, lobes 5, suborbicular, fleshy, 1.2 x 1.5 - 2.0 mm. Stamens 5; filament 1.3 mm long; anther ovate, 1.0 mm long. Ovary hemispherical, superior; locule 1; ovule 1; style 1 mm long, bi or tri lobed, persistent. Fruit semi-globose, 3.5 mm diameter, pericarp membranous. Seed 1, circular, 2-3 mm diam, testa membranous, transparent.

HABITAT: *S. arbusculoides* occurs in poorly drained tidal areas, in sands and muds, open salt pans and mangrove shrublands are common habitats. Associates include *Sporobolus virginicus, Batis argillicola, Tecticornia australasica* and *Avicennia marina.*

DISTRIBUTION: *S. arbusculoides* is known from only a few localities in the N.T., this is a reflection of undercollection rather than real distribution. Endemic to Australia this species also occurs in Western Australia and Queensland.



NOTES: Previously this species had been referred to as *S. australis* (R.Br.) Moq.; L.S. Smith recognised two species and described *S. arbusculoides* in 1969.

S. arbusculoides produces flowers and fruit throughout the year, though a peak exists in November-December. The small white flowers are insect pollinated. The fleshy green fruit is not particularly adapted to water dispersal, van der Pijl (1969) notes birds distributing seeds of the European *Suaeda maritima.*

TECTICORNIA Hook. f. CHENOPODIACEAE

DERIVATION: The Greek "stegan" (covering) and the Latin "cornu" (horn) are a reference to the bracts which cover the flowers.

A genus of three species, two are endemic to Australia. The third, *T. australasica*, occurs in Java, New Guinea and N.T. tidal areas.

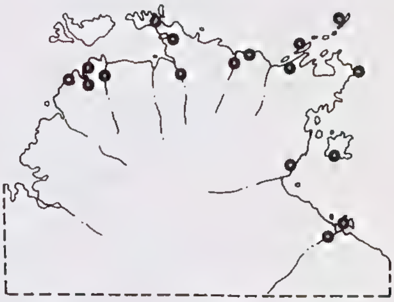
Tecticornia australasica (Moq.) Paul G. Wilson

DERIVATION: The Latin "australasica" pertains to Australasia.

Annual to 40 cm high, glaucous, glabrous; lower branches procumbent, upper branches erect. Articles bluish-green, succulent, 7-15 mm long, apex shortly bilobed, lobes representing reduced, opposite leaves. Spikes terminal, occasionally lateral and sessile, narrowly ovoid to narrowly cylindrical, 10-40 x 5-7 mm; bracts decussate, free, semi-circular; flowers sessile, bisexual, 3-5 per bract. Perianth succulent; tepals 2 laterally compressed, acute, plano-convex, base united abaxially. Stamen 1, abaxial. Ovary thin walled, superior, 2-3 carpellate, unilocular, ovule one; style slender, 2 lobed. Fruiting tepals free, areolate and hyaline when dry; pericarp membranous. Seed ovately discoidal, c. 1.5 mm long; testa dark brown with several rows of grey tubercles on upper margins.

HABITAT: *T. australasica* may be found on coastal saltpans or associated with mangrove areas. Associates include *Suaeda arbusculoides, Halosarcia indica, Batis argillicola, Sporobolus virginicus, Avicennia marina* and *Osbornia octodonta*. Substrates include muds and fine sands. Seasonal inundation by freshwater is preferred as *T. australasica* is intolerant of highly saline areas.

DISTRIBUTION: *T. australasica* occurs sporadically across the N.T. coastline and also occurs in Queensland. Extra Australian records from New Guinea and Java are known.



NOTES: Taxonomy of this species has been confused (Wilson 1972), in part due to poor material being available. The nomenclatural confusion surrounding the name is outlined by Wilson (1972).

Fertile spikes may be observed from June to December. Seed germinates at the end of the wet season from March to April, *T. australasica* has an annual lifecycle. Seeds of this species are capable of floating while enveloped by the infructesance, and are released upon disintegration of these parts (Kanis 1976).

Whilst no Aboriginal usage is reported for this species, seeds of the other two members of the genus are eaten (Wilson 1972).

References: Wilson 1972.

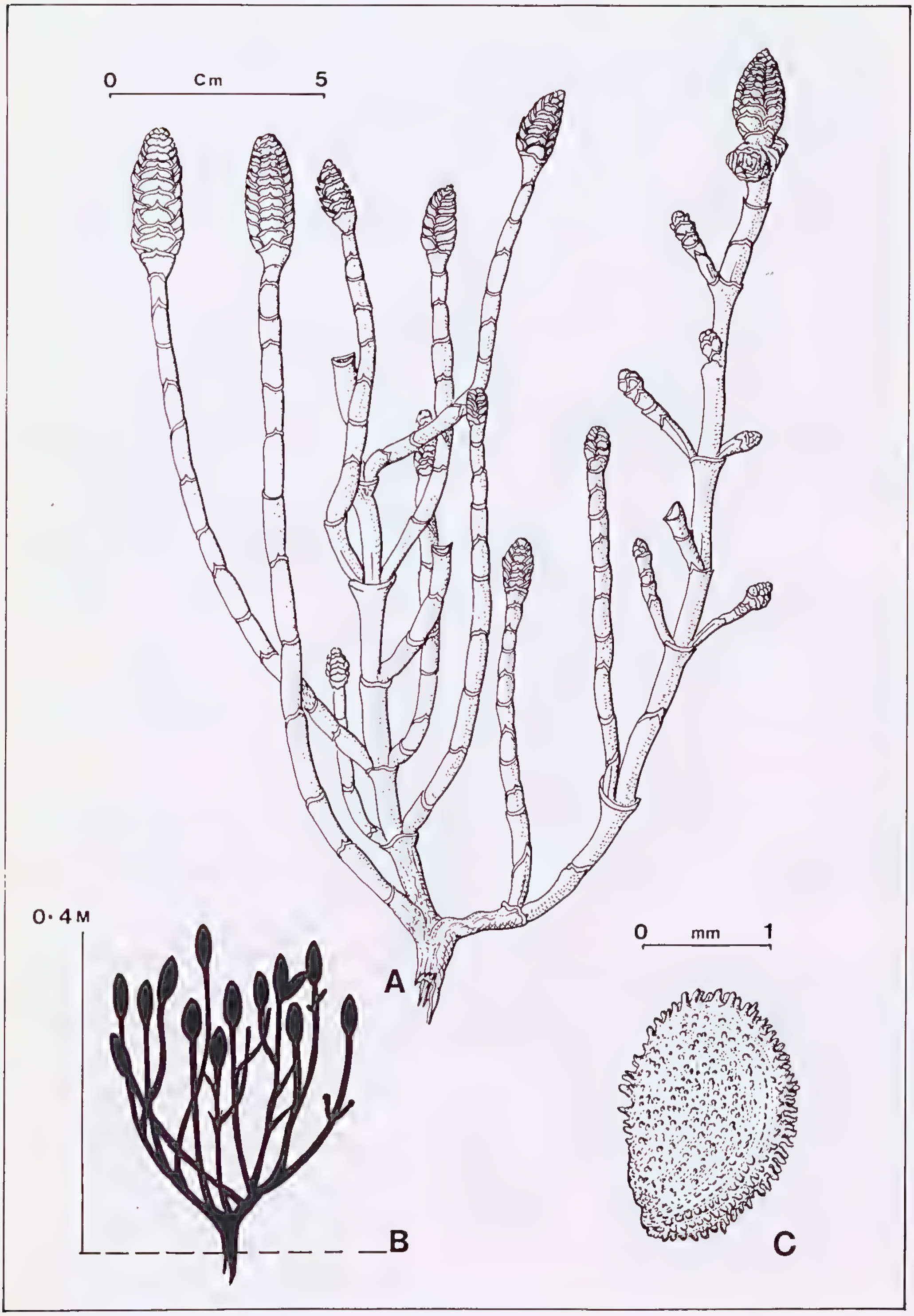


Figure 35. ***Tecticornia australasica.*** A, fertile branch; B, habit; C, seed (A-C, G. Wightman 815 & G. Wightman 2100, DNA).

DERIVATION: The Greek "thespesios" (divine) refers to *T. populneoides*, a sacred plant in Tahiti where it is grown around places of worship.

A pantropical genus of approximately 15 species, two occur in Australia and the Northern Territory. One, *T. populneoides*, is found in tidal situations in the N.T.

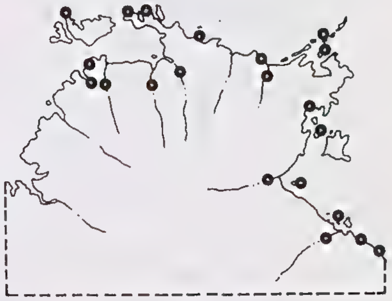
Thespesia populneoides (Roxb.) Kostel

DERIVATION: Possibly due to its similarity to *Thespesia populnea.*

Shrub or tree to 8 m; bark grey, smooth with shallow depressions; young growth, leaves and twigs closely lepidote. Leaves spirally arranged; lamina broadly deltoid, 7-15 x 7.5-13.5 cm, apex acuminate, base caudate, domatia conspicious on underside of leaf in axils of main veins; petiole 5.0-14.5 cm long; stipules lanceolate, 5-10 mm long caducous. Flowers axillary, solitary; pedicel 5-12 cm long, drooping; involucral bracts 3, ovate, very early caducous. Calyx coriaceous, cupular, 10-14mm long, entire or with 5 minute teeth, exterior densely lepidote. Corolla large, yellow with purple centre, campanulate; petals 5, obovate, 6.0-7.0 x 4.5-6.0 cm, apex rounded, base fleshy. Staminal column shorter than petals, anthiferous throughout; filaments 4 mm long; anthers 1.5 mm long. Ovary globose to ovoid, superior, 5 locular, ovules 4 per locule; styles connate, 4 cm long; stigmas united into a clavate, 5 sulcate body, 5 x 3 mm. Fruit woody, sparsely lepidote, subglobose 3 x 2 cm, apex slightly depressed, tardily dehiscent. Seeds 4 per cell, obovoid, angular, 8-15 x 6-9 mm; pubescence short, dense.

HABITAT: *T. populneoides* occurs at the rear of mangal environments, in areas that are not regularly inundated by tide. Sandy soils are preferred, though fine muds are occasionally colonised. Associates include *Avicennia marina, Lumnitzera racemosa, Hibiscus tiliaceaus* and *Sporobolus virginicus*. This species is also found above the high tide limit on stabilised sand dunes.

DISTRIBUTION: *T. populneoides* is widespread across the northern N.T. coast, and also occurs in Western Australia and Queensland. Extra Australian records are from the coasts of the Indian Ocean.



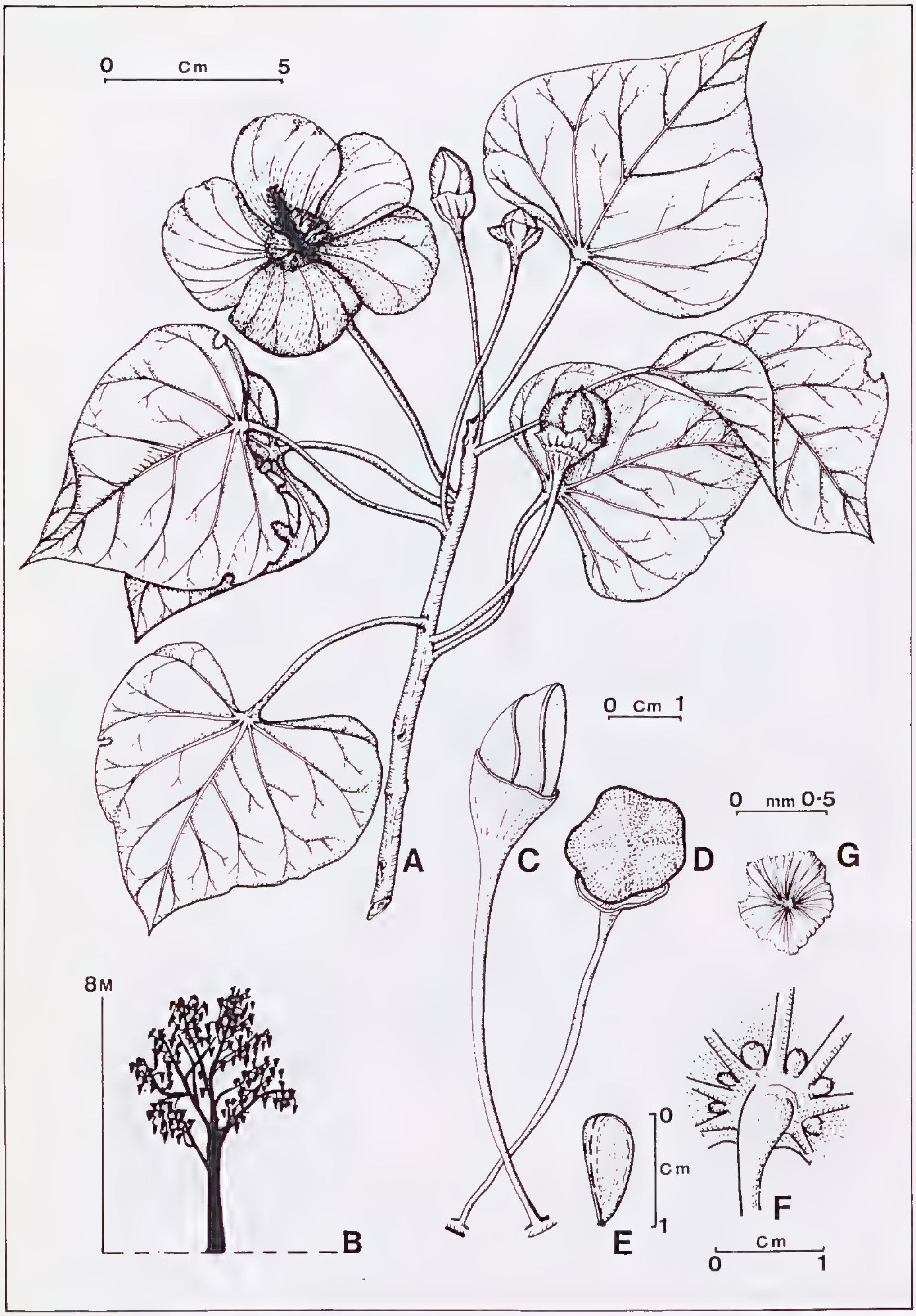


Figure 36. ***Thespesia populneoides***. A, flowering and fruiting branch; B, habit; C, bud; D, fruit; E, seed; F, domatia; G, scale (A-C, N. Byrnes 207, DNA; D-G, G.Wightman 104 & C. Dunlop, DNA).

NOTES: The correct name for this species has been subject to confusion in the past, Fosberg & Sachet (1972) appear to have clarified the situation between *Thespesia populnea* and *T. populneoides*. All Northern Territory material is of the latter species.

The large, showy flowers of *T. populneoides* are bird pollinated; the woody capsule and bouyant seeds are well adapted to water dispersal. Guppy (1906) notes seeds of the closely related *T. populnea* are capable of floating for 12 months and then germinating. *T. populneoides* produces flowers from February to July; fruits occur from March to September. The flowers and fruits produce a yellow exudate when cut.

Aboriginals use *T. populneoides* for spears (Wightman and Smith 1989), plates (Levitt 1981), axe handles (Smith & Kalotas 1985), fish poison (Cribb & Cribb 1981) and as a treatment for scabies and other cutaneous disorders (Lassak & McCarthy 1983). In India, this species furnishes fibre from the bark, yellow dye from the fruit, claret colored dye from the heartwood and timber for boats and gunstocks (Maiden 1975). In Sri Lanka *T. populnea* and *T. populneoides* hybrids are propagated vegetatively as ornamentals and living fence posts (Fosberg & Sachet 1972).

References: Fosberg & Sachet 1972.

XYLOCARPUS Konig MELIACEAE

DERIVATION: The Greek "xylo" (woody) and "carpus" (fruit) refer to the woody fruit of this genus.

A genus of three old world species, two are considered mangroves and occur in tidal areas of the N.T.; the third, which is not strictly a mangrove, does not occur in Australia.

Trees, deciduous, monoecious, with pneumatophores. Leaves compound, spirally arranged, imparipinnate; leaflets 2-3 pairs, entire, glaucous. Inflorescence axillary, thyrsiform panicles. Flowers unisexual with strongly developed vestiges of opposite sex. Calyx 4-lobed, valvate. Corolla lobes 4, free. Staminal filaments fused into shortly 8 - fid tube, anthers or antherodes alternative with segments. Disc fleshy enveloping ovary; ovary ovoid, superior, 4 locular, ovules 3-4(-6) per locule, placentation axile; style short; stigma capitate, orbicular, 1.5 mm diam.. Capsule subspherical, coriaceous, woody, 4 valved, dehiscence tardy. Seeds 8-20, tetrahedral or pyramidal, margins angular, testa corky with inlaid fibres.

KEY TO SPECIES:

1.	Bark longitudinally fissured, light brown; pneumatophores conical; fruit < 10 cm diameter	*X. mekongensis*
1.	Bark irregularly fissured, flaky , red brown; pneumatophores meandering, vertical plates; fruit > 15 cm diameter	*X. granatum*

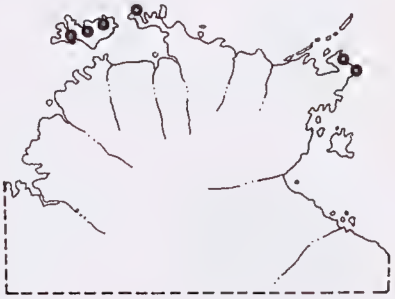
Xylocarpus granatum Konig

DERIVATION: The Latin "granatum" (having many seeds) refers to the fruit of this species.

Tree, spreading, to 8 m high; bark red-brown, irregularly fissured, flakey; pneumatophores meandering vertical plates. Leaves 15 cm long; petiole 5 cm long; leaflet lamina broadly elliptic 3.5-6 x 7-11 cm, not distinctly bifacial, apex obtuse, base cuneate; petiolule robust, 9mm long. Inflorescence 4-7 cm long, 8-20 flowered; pedicels 4-6 mm long. Calyx 2 mm long. Corolla lobes spreading, broadly elliptic, 5 x 2 mm, apex obtuse. Staminal tube urceolate, 5 mm long, segments 1 mm long, acuminate; anthers 1 mm long, dorsifixed, adnate to tube rim. Capsule 15-20 cm diameter. Seeds 7-9 cm long.

HABITAT: *X. granatum* is confined to mangrove formations that receive a strong flow of freshwater on a perennial basis. Soft fine grained soils are preferred, associates include *Rhizophora apiculata, Lumnitzera littorea* and *Dalbergia candenatensis.*

DISTRIBUTION: *X. granatum* is a rare component of N.T. mangals, collections exist from Melville Island, Cobourg Peninsula and Gove. A further population is known from Groote Eylandt (Specht 1958, Levitt 1981). This species is also recorded from Western Australia and Queensland, extra Australian occurrences include mangrove areas of the old world tropics.



NOTES: *X. granatum*, like the more common *X. mekongensis*, exhibits a great deal of leaf variation (see notes under that species).

Phenology appears to be similar to *X. mekongensis* but copious field data is lacking. Seed of *X. granatum* is adapted to water dispersal in a similar fashion to the seed of *X. mekongensis*. Flowers

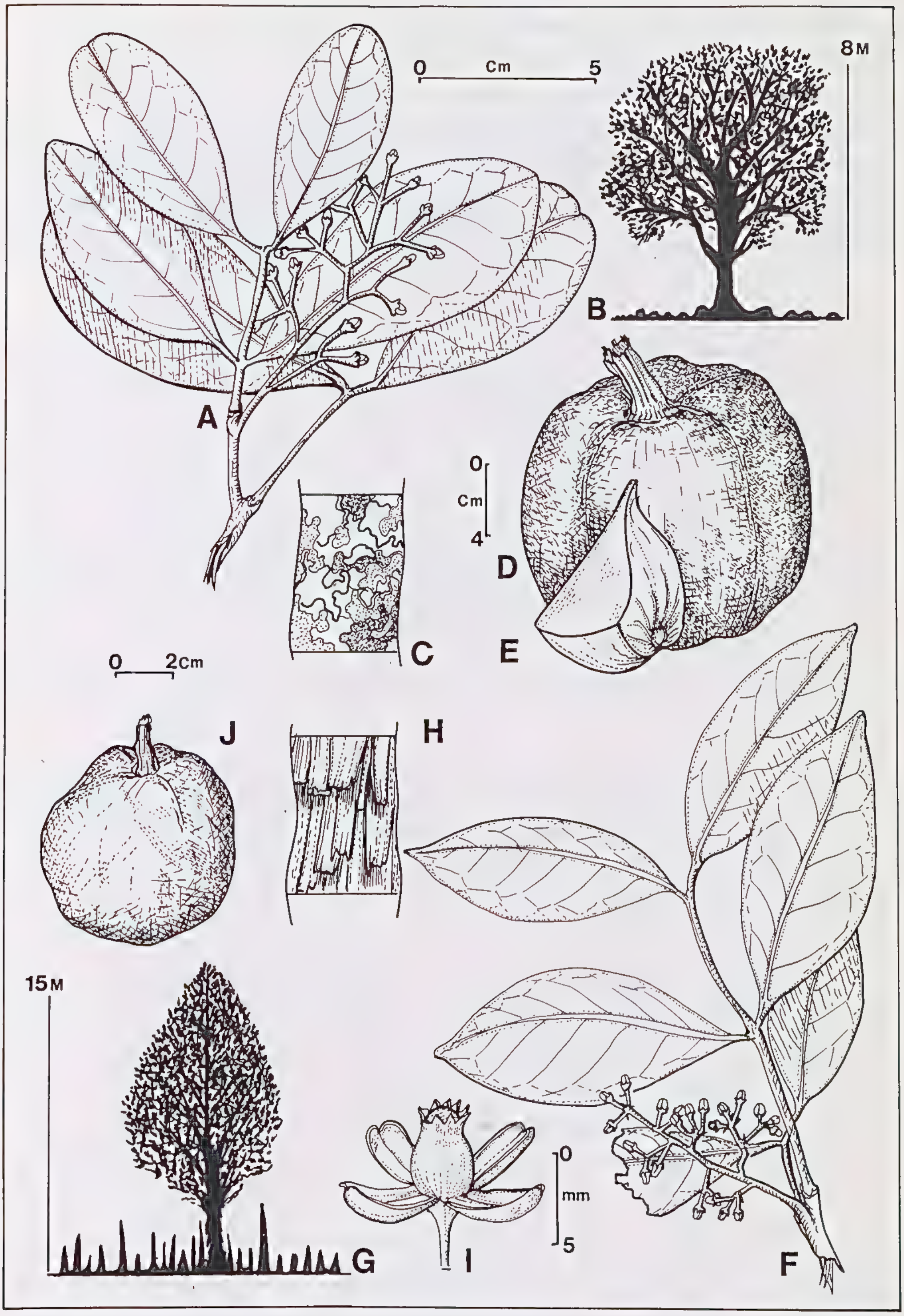


Figure 37. ***Xylocarpus***. A-E, *X. granatum*. A, flowering branch; B, habit; C, bark; D, fruit; E, carpel (A-E, G. Wightman 405 & C. Dunlop, DNA). F-J, *X. mekongensis*. F, flowering branch; G, habit; H, bark; I, flower; J, fruit (F-J, G. Wightman 686, DNA).

of *X. mekongensis* are strongly scented, and produce nectar from the disc, this would suggest insect pollination, but no field observations have been made.

X. granatum usually exists towards the freshwater end of tidal waterways. However one tree from the Fort Dundas area, Melville Island, was found on a sandy beach at the high tide limit. A small, perennial, freshwater soak near the base of the tree provided the freshwater input that this species requires for survival.

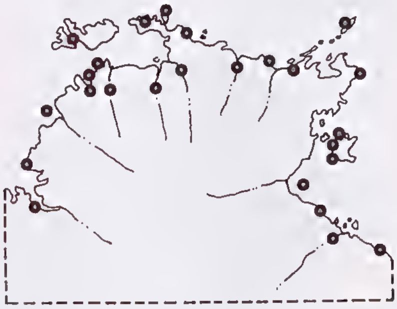
Xylocarpus mekongensis Pierre

DERIVATION: The Latin "mekongensis", pertains to the Mekong area, apparently where the type material of this name was collected.

Tree, columnar to 15 m; bark light brown, peeling in longitudanal flakes; pneumatophores conical, robust. Leaves to 20 cm long; leaflet lamina bifacial, elliptic, 4.5-12 x 2-7.5 cm, apex acute to obtuse, base cuneate; petiolule stout, 2-4 mm long. Inflorescence 4-6.5 cm long, 9-35 flowered; pedicels 6-10 mm long. Calyx 2 mm long. Corolla lobes spreading, 5 x 2 mm, broadly elliptic, apex obtuse. Staminal tube urceolate, 5 mm long, segments 1 mm long, acuminate; anthers 1 mm long, dorsifixed, adnate to tube rim. Capsule 5-10 cm diameter. Seeds 4-6.5 cm long, corky.

HABITAT: *X. mekongensis* is regularly found in forests fringing tidal waterways, at the rear of coastal mangals and in swales behind coastal dunes. Substrates include sands and muds, freshwater input for some part of the year is preferred. Associates include *Bruguiera parviflora, Rhizophora stylosa* and *Diospyros littorea.*

DISTRIBUTION: *X. mekongensis* is common and widespread across the N.T. coastline, extending in range to Western Australia and Queensland. Extra Australian occurrences include New Guinea, East Africa, Asia and the Pacific.



NOTES: Groote Eylandt Aboriginals use *X. mekongensis* for canoe repairs and consider it a good shade tree (Levitt 1981). Watson (1928) reports Malayans using *Xylocarpus* spp for timber, firewood, as a source of lighting oil and hair oil, while a decoction of bark was used to treat cholera. New Guineans extract a dye (Percival & Womersley 1975).

Leaflets of *X. mekongensis* are extremely variable in size and texture, from small (4.5-2.0 cm), thin leaflets to large (12 x 6.5 cm), succulent leaflets. Leaf fall occurs in the mid dry season (June-July), new leaves may be seen from August to September. Flowers are produced during June and July. Fruit mature during November-December. Pollinators of *X. mekongensis* are insects, probably native bees (Tomlinson 1986), though field observations are lacking. The corky testa of *X. mekongensis* seed allows it to remain afloat for more than 2 months, Guppy (1906) notes the propensity of seed to germinate while afloat. Seeds are often found amongst drift at the high tide mark, many are rendered infertile because of insect attack.

The correct name for this species has been confused, in the past *X. australasicus* Ridley, has been used. Further confusion has existed over the number of species of *Xylocarpus* present in the N.T. Reports of *X. moluccensis* (Lamk.) Roem. occurring in the Northern Territory appear to have arisen due to the misinterpretation of the different bark types exhibited by juveniles and adults of *X. mekongensis.*

References: Blake 1954, Pennington & Styles 1975.

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CONSERVATION COMMISSION
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DARWIN HARBOUR MANGROVES

The mangrove communities of the Northern Territory constitute 35% of the total area of mangrove in Australia. The mangroves of Darwin Harbour are among the most floristically diverse and extensive in the N.T. Although no rare or endangered species occur in Darwin Harbour mangrove communities, they form one of the most significant mangrove resources in the Northern Territory.

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DARWIN HARBOUR MANGROVES

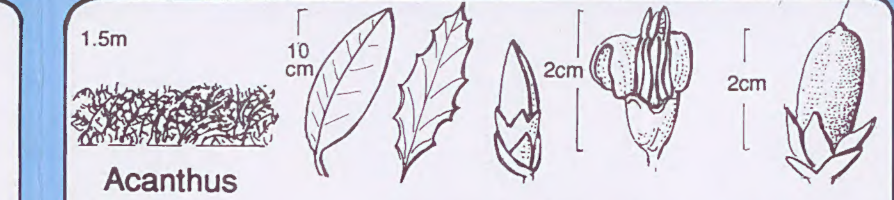
The mangrove communities of the Northern Territory constitute 35% of the total area of mangrove in Australia. The mangroves of Darwin Harbour are among the most floristically diverse and extensive in the N.T. Although no rare or endangered species occur in Darwin Harbour mangrove communities, they form one of the most significant mangrove resources in the Northern Territory.

This folding chart is designed to facilitate field identification of mangroves; the 36 species are arranged alphabetically by genus and species name.

On the reverse side of this chart all 48 mangrove species known from the Northern Territory are depicted, they are grouped according to leaf type and arrangement as an aid to identification.

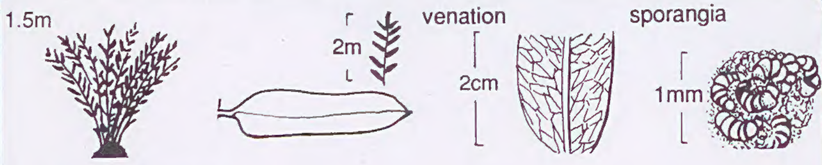
For a full discussion of Northern Territory mangroves refer to "Mangroves of the Northern Territory", Glenn M. Wightman, Northern Territory Botanical Bulletin No.7, Conservation Commission of the Northern Territory, Palmerston.

Compiled by Glenn Wightman, illustrated by Milton Andrews



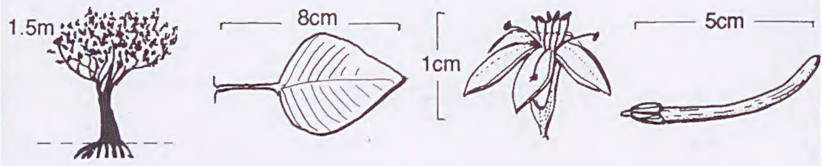
Acanthus ilicifolius

Spreading **subshrub** forming dense thickets to 1.5 m; **leaves** opposite, ovate, 5-15 x 2-6 cm, margin often spiny; axillary spines to 5 mm; **flowers** pale purple, 2 cm long; **fruit** oblong, 2.5 cm long, brown.



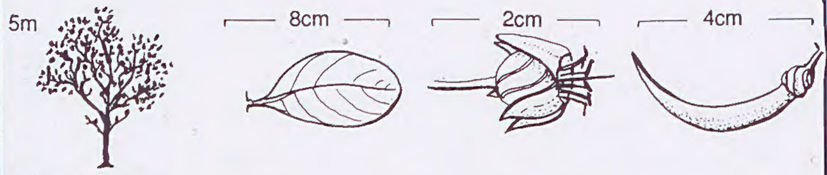
Acrostichum speciosum

Perennial **fern** forming coarse clumps to 1.5 m; **fronds** pinnate, 1-3 m long, pinnae (**leaflets**) oblong, 10-20 x 2-3 cm, dark green with distinct venation; fertile pinnae rusty coloured, with **spores** underneath.



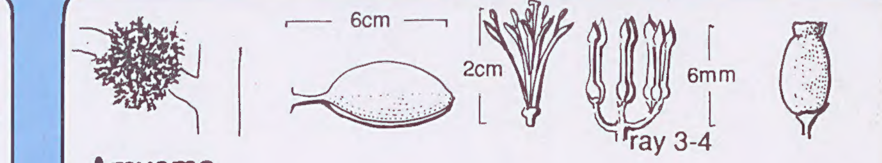
Aegialitis annulata

Shrub to 1.5 m; stem base swollen; **leaves** alternate, broadly ovate, 6-8 x 4.6 cm, petiole, winged, sheathing stem; **flowers** white, petals 4; **fruit** narrow, curved, 50 x 2 mm, dull crimson.



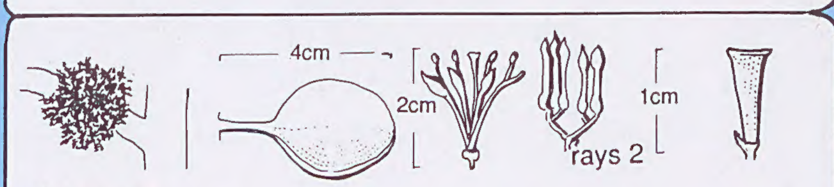
Aegiceras corniculatum

Shrub or small **tree** to 5m; **bark grey-brown;** leaves alternate, obovate, 4-8 x 2-4 cm; **flowers** cream, strongly scented, 1cm long, petals 5; **fruit** cylindrical, curved, 4 cm long, pointed.



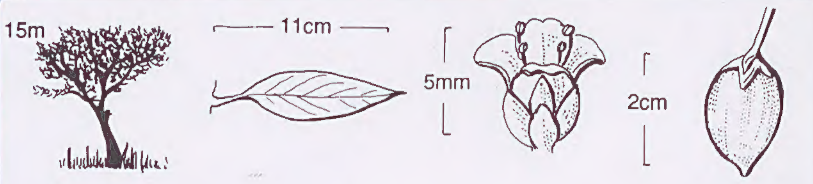
Amyema mackayense

Stem parasite (**mistletoe**); **leaves** opposite, elliptic, 3-6 x 2-5 cm; **inflorescence** with 3-4 branches; **flowers** red and green, petals 5, 2 cm long; **fruit** 6 mm long; various host plants.



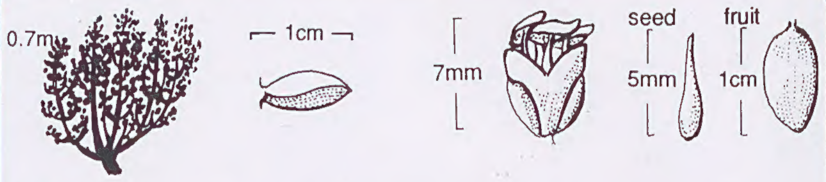
Amyema thalassium

Stem parasite (**mistletoe**); **leaves** opposite, rounded, 2-4 x 2-4 cm, often fleshy; **inflorescence** with 2 branches; **flowers** green and red, petals 4, 2 cm long; **fruit** 12 mm long; host plant *Avicennia marina*.



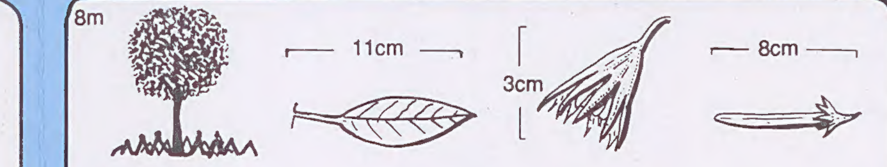
Avicennia marina

Erect and spreading **tree** to 15 m; **bark** smooth, green mottled; **pneumatophores** pencil-like; **leaves** opposite, narrow ovate, 5-11 x 2-4 cm; **flowers** orange, 4 mm diameter; **fruit** ovoid, fleshy, 1.5 x 2 cm



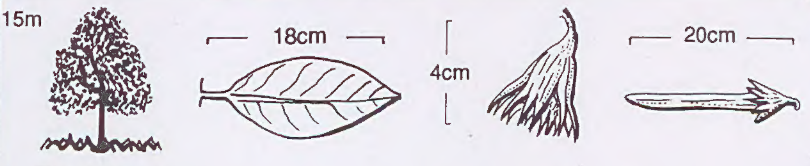
Batis argillicola

Small **shrub** to 70 cm; **bark** grey, fibrous; **leaves** opposite fleshy obovoid, 4-15 x 1.5 mm; **flowers** minute, 7 mm long; **fruit** fleshy obovoid, 10 x 5 mm yellowish when ripe.



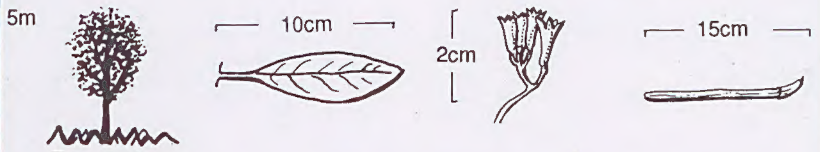
Bruguiera exaristata

Rounded **shrub** or **tree** to 8 m; viviparous; **bark** grey tessellate; **pneumatophores** knee-like; **leaves** opposite, elliptic-obovate, 5-12 x 2-5 cm, **flowers** single, drooping, **fruit** 13-16 mm long; **hypocotyl** cylindric 5-7 x 0.5-1 cm, blunt.



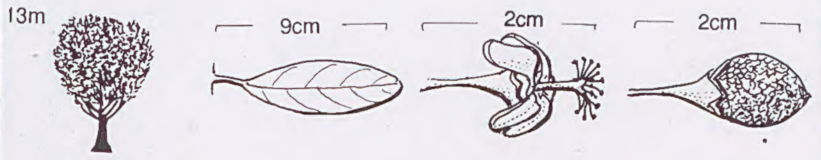
Bruguiera gymnorrhiza

Erect **tree** to 15 m; viviparous; **bark** grey to brown,tessellate; **pneumatophores** knee-like; **leaves** opposite, elliptic 9-18 x 4-7 cmm; bud and calyx red coloured; **fruit** 2.5 cm long; **hypocotyl** 12-20 cm long ridged, blunt.



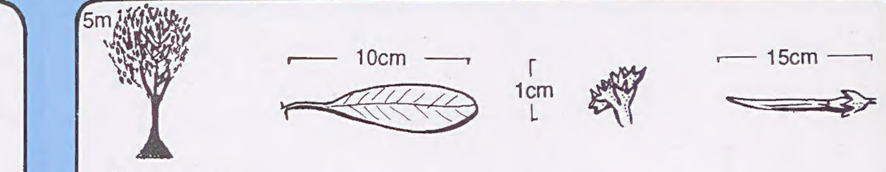
Bruguiera parviflora

Slender **tree** to 5 m, viviparous; **bark** grey fissured; **pneumatophores** knee-like; **leaves** opposite, narrow elliptic, 5-10 x 2-4 cm; **flowers** erect clustered; **fruit** 2 cm long; **hypocotyl** cylindric, narrow, 8-15 x .4-.6 cm, pointed.



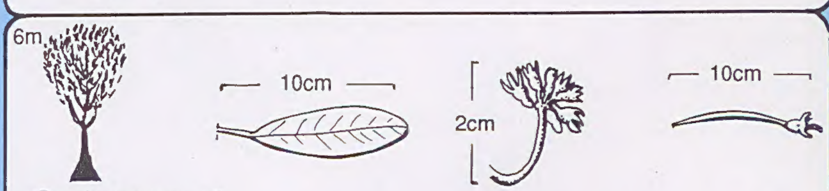
Camptostemon schultzii

Tree to 10 (22) m; **bark** grey smooth; **leaves** alternate, elliptic, 6-9 x 2-4 cm, underside with small brown scales; **flowers** white 1.5 cm diameter, **fruit** obovoid, 1 cm long; seeds woolly.



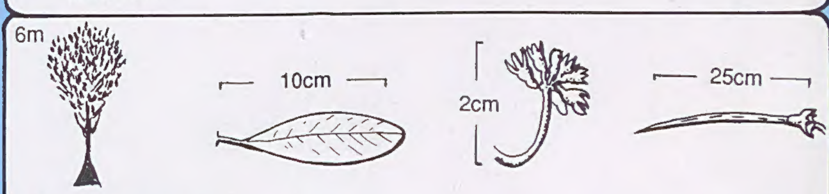
Ceriops decandra

Shrub or small **tree** to 5 m, viviparous; **bark** brown, **leaves** opposite, elliptic oblong, 3-10 x 1-4 cm; **inflorescence** stout, 2-4 flowered; petals fringed; **fruit** 15-18 mm long lobes erect; **hypocotyl** 6-15 cm long, ridged.



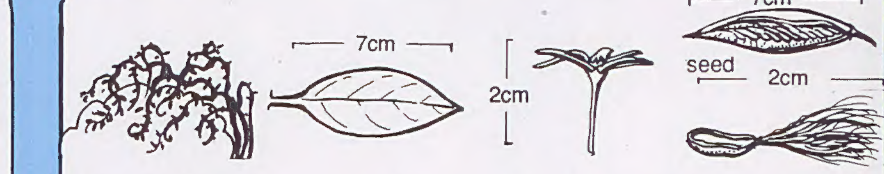
Ceriops tagal var. australis

Shrub or small **tree** to 6 m; **bark** grey; **leaves** opposite, obovate-elliptic, 5-10 x 2-4 cm; **inflorescence** pendulous, 5-10 flowered, petals lobed; **fruit** < 10 mm long, lobes reflexed; **hypocotyl** 4-10 cm long, smooth.



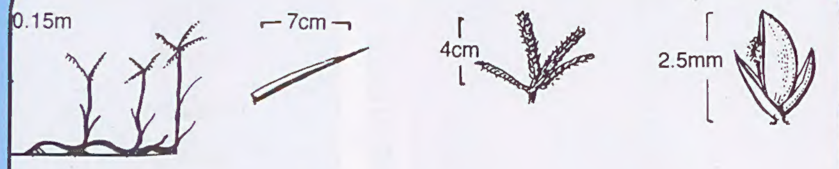
Ceriops tagal var. tagal

Shrub or small **tree** to 6 m; viviparous; **bark** grey; **leaves** opposite, obovate-elliptic, 5-10 x 2-4 cm; **inflorescence** pendulous, 5-10 flowered; petals lobed; **fruit** > 15 mm long, lobes reflexed; **hypocotyl** 15-25 cm long ridged.



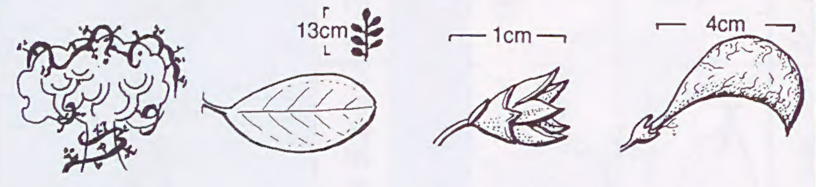
Cynanchum carnosum

Climber; **bark** smooth, green; **leaves** opposite, elliptic, variable 2-8 x 0.5-3 cm, fleshy to leathery; **flowers** green, 1.5 cm diameter, petals 5; **fruit** lanceolate 8 x 1cm; **seeds** with long silky hairs.



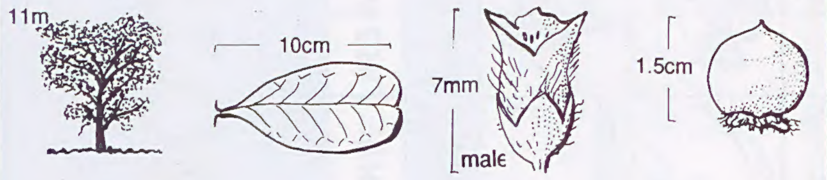
Cynodon dactylon

Perennial **grass**; stems prostrate, mat-forming; **leaves** alternate 2-7 x 0.1-0.2 cm; **inflorescence** 3-5 armed, borne on culm to 15 cm, arms curved 5 cm long; **glumes** 1.5 mm long.



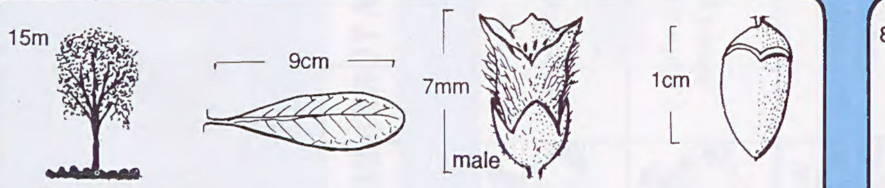
Dalbergia candenatensis

Climber; **bark** dark grey lenticellate; **leaves** alternate, compound; leaflets 3-7, 1.5-3 x 2-4 cm; **flowers** white, pea-like, small; **fruit** sickle-shaped 2-3 x 1-2 cm, distinct veins.



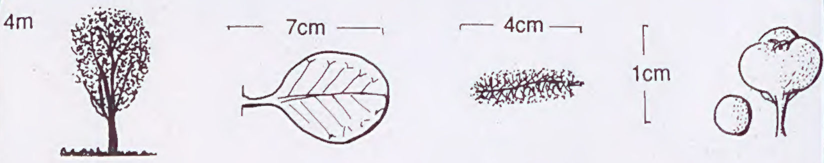
Diospyros compacta

Tree to 11m; **bark** grey mottled to black tessellate; **pneumatophores** knotted at ground level; **leaves** alternate, broadly elliptic, 5-10 x 3-5 cm, distinct venation; **fruit** globular, 13 x 10 mm, calyx reflexed.



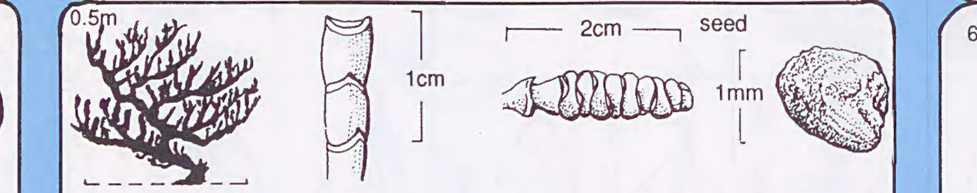
Diospyros littorea

Tree to 15 m; **bark** grey, smooth; **pneumatophores** knotted at ground level; **leaves** alternate, narrow elliptic, 6-10 x 2-4 cm, venation indistinct; **fruit** ovoid, 10 x 14 mm, calyx clasping fruit.



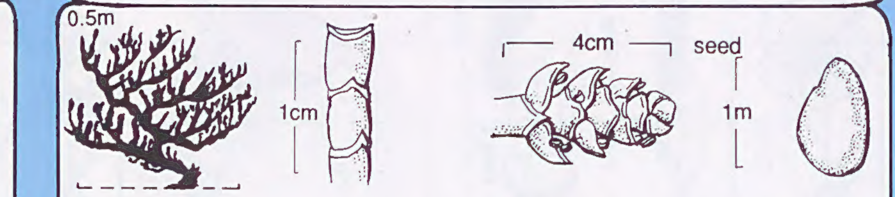
Excoecaria ovalis

Small tree to 5 m with white latex, **bark** grey finely fissured; **leaves** obovate or elliptic 3-7 x 2-5 cm; **inflorescence** a crowded spike to 4 cm long; **fruit** 3 lobed, 1 cm diameter.



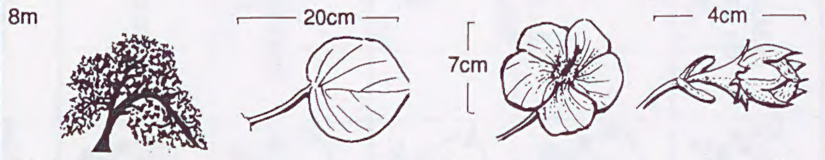
Halosarcia halocnemoides

Spreading **shrub** to 0.5 m; **leaves** much reduced, apparently absent; **stems** fleshy, composed of distinct segments, segments barrel-shaped 5 x 2 mm dull to glossy; **inflorescence** cylindrical, 25 mm long.



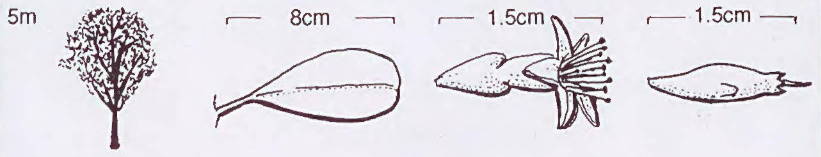
Halosarcia indica

Spreading or erect **shrub** to 0.5 m; **leaves** much reduced, apparently absent; **stems** fleshy composed of distinct segments, segments cylindrical, 5-10 mm long; **inflorescence** ovoid to 40 mm long.



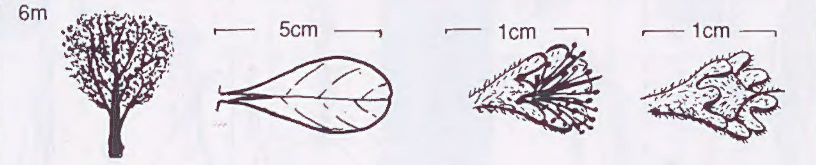
Hibiscus tiliaceus

Spreading **tree** to 8 m; **bark** grey mottled, smooth; **leaves** alternate, orbicular, 7-15 x 7-14 cm, glossy above, dull below; **flowers** yellow, 7 cm diameter, petals 5; **fruit** globose 2 cm diameter, splitting into 3 segments.



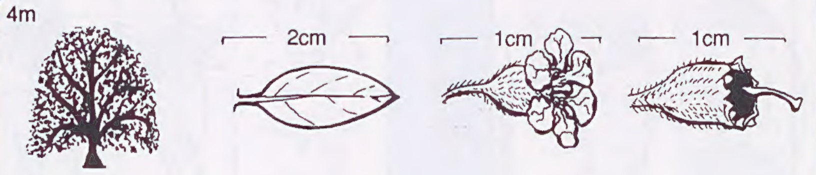
Lumnitzera racemosa

Shrub or small **tree** to 5 m; **bark** grey to black, fissured; **leaves** alternate, obovate 3-10 x 1-3 cm; **flowers** white, 1.5 cm long petals 5; **fruit** flattened ellipsoidal, 11 x 4 mm, corky.



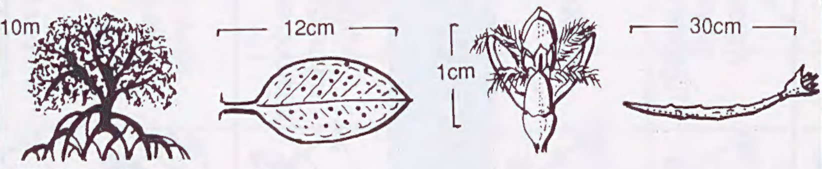
Osbornia octodonta

Shrub or small **tree** to 6 m; **bark** grey fibrous; **leaves** opposite, obovate, 3-5 x 2-3 cm, strongly odorous when crushed; **flowers** 1 cm long, grey-green; **fruit** 1 cm long, grey.



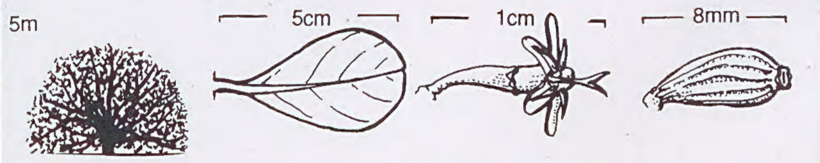
Pemphis acidula

Spreading **shrub** to 4 m; **bark** light grey; **leaves** opposite, ovate to obovate, 1-2 x 0.5-1 cm, covered in short hairs; **flowers** white with 6 crumpled petals; **fruit** spherical, 5 mm diameter.



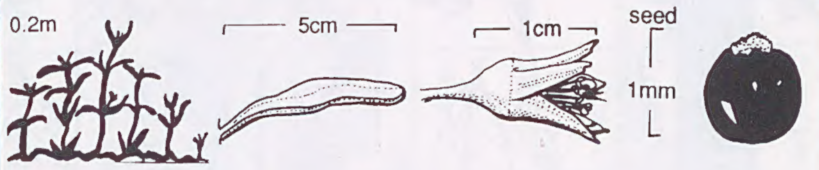
Rhizophora stylosa

Tree to 10 m; viviparous; **pneumatophores** as conspicuous prop-roots; **leaves** opposite, elliptic, 6-12 x 3-7 cm; underside spotted; **flowers** white, 4 petals; **fruit** 3 cm long; **hypocotyl** cylindric 20-32 cm long.



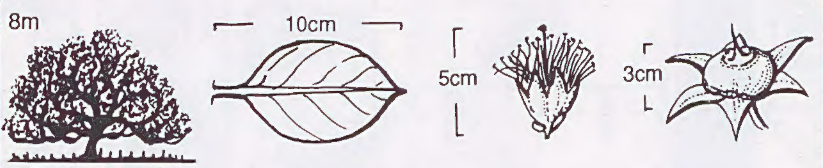
Scyphiphora hydrophylacea

Spreading **shrub** to 5 m; **bark** rough, brown; **leaves** opposite, obovate, 2-5 x 4-7 cm; new leaves resinous; **flowers** 1 cm long, white, petals 4; **fruit** 8 mm long ridged, corky.



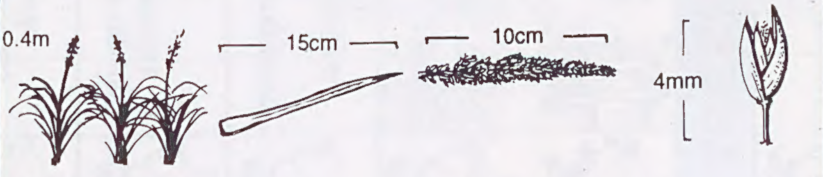
Sesuvium portulacastrum

Spreading succulent **herb**; **leaves** opposite, strap-like, 25-70 x 5-15 mm; **flowers** pink, 1 cm long, petals 5; **fruit** obovoid, smooth, 8 mm long; **seeds** pea-shaped.



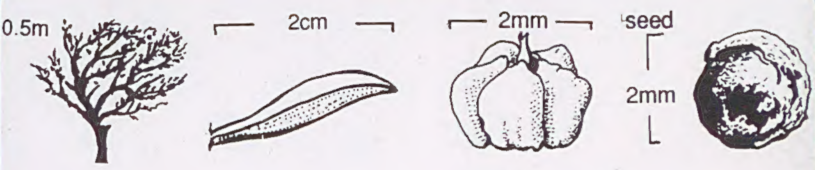
Sonneratia alba

Spreading **tree** to 8 m; **bark** smooth, cream-brown; **pneumatophores** pencil-like to 25 cm high; **leaves** opposite, obovate 5-11 x 3-8 cm; **flowers** with many white stamens; **fruit** depressed globular, 3 cm diameter.



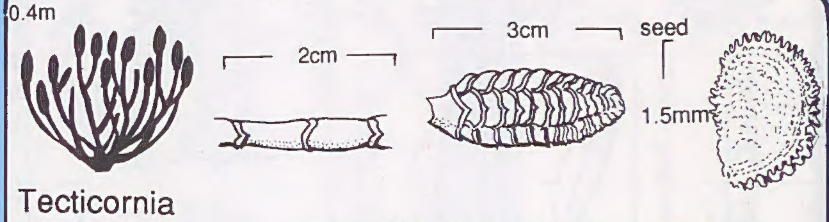
Sporobolus virginicus

Perennial **grass**; stems below ground, foliage erect; **leaves** alternate to 5 cm long, **inflorescence** spike-like, dense, 10 cm long; **spikelets** leaden coloured, 2.5 mm long.



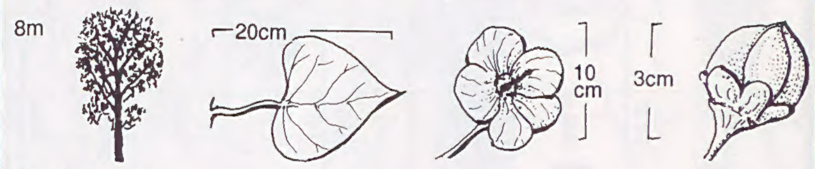
Suaeda arbusculoides

Erect woody **subshrub** to 0.5 m; **leaves** alternate, succulent, oblanceolate, 10-20 x 2-3 mm; **flowers** 2 mm diameter, fleshy; **fruit** semi-globose, 3-5 mm diameter, yellowish.



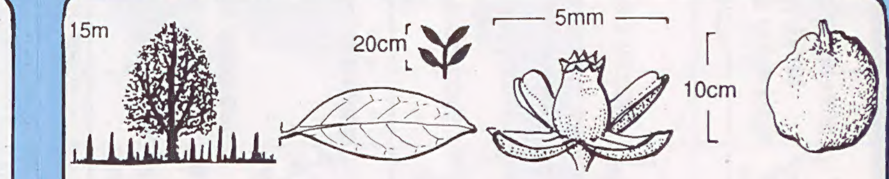
Tecticornia australasica

Annual bluish-green succulent **herb** to 40 cm; glaucous; **leaves** reduced, stems succulent; articles of stem 7-15 mm long; **spikes** terminal, ovoid, 10-40 mm long; **fruit** enclosed in fleshy inflorescence.



Thespesia populneoides

Tree to 8 m; **bark** grey, smooth; young growth covered in small brown scales; **leaves** alternate, deltoid, 7-15 x 7-14 cm; **flowers** yellow, 10 cm diameter, petals 5; **fruit** subglobose, woody, 3 x 2 cm.

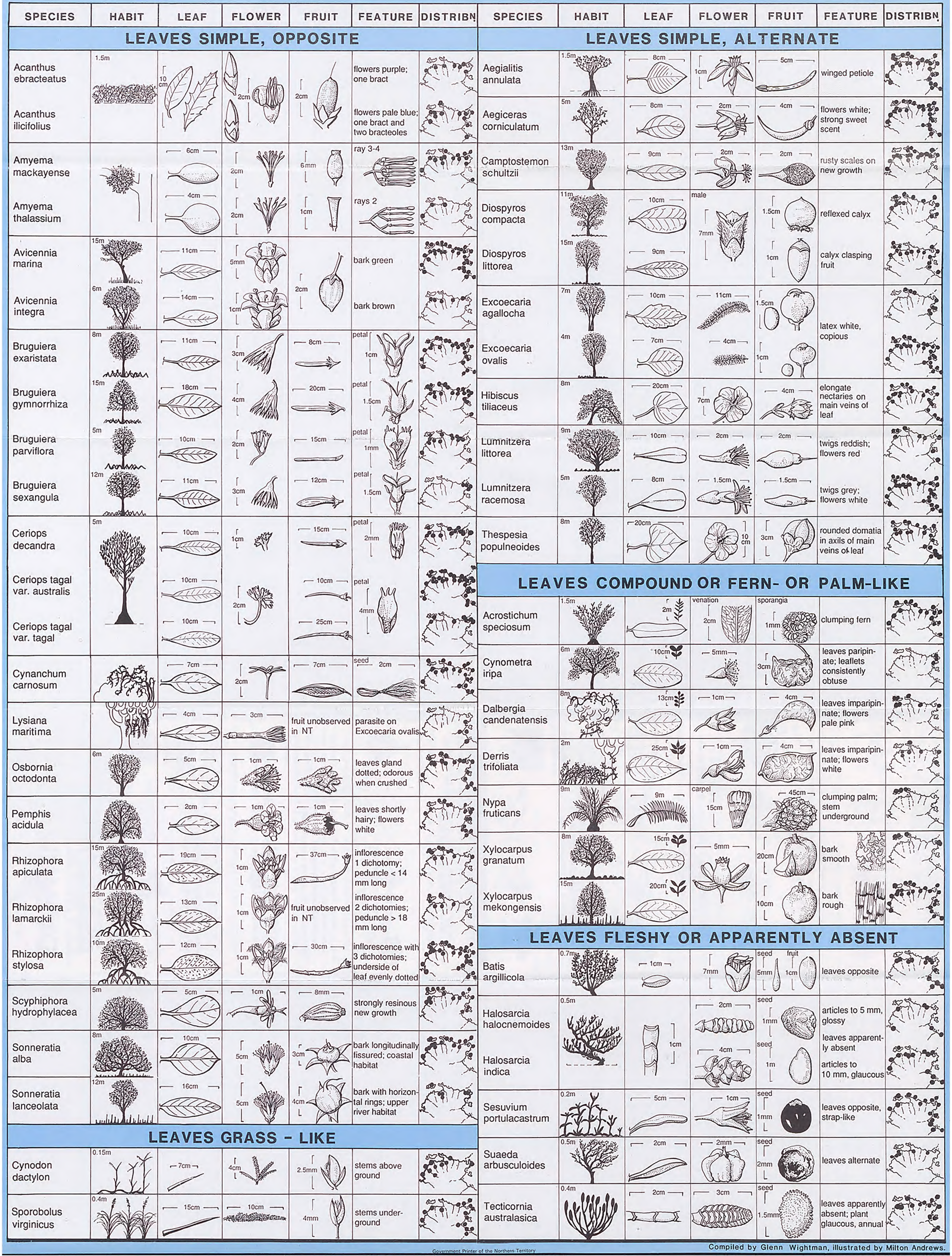


Xylocarpus mekongensis

Tree to 15 m; **bark** brown flaky; **pneumatophores** conical; **leaves** compound, **leaflets** 4-6, elliptic 4-12 x 2-8 cm; **flowers** pink-white, 5 mm long; **fruit** spherical 5 cm diameter.

MANGROVES OF THE NORTHERN TERRITORY

CONSERVATION COMMISSION NORTHERN TERRITORY



LEAVES SIMPLE, OPPOSITE

SPECIES	HABIT	LEAF	FLOWER	FRUIT	FEATURE	DISTRIBN
Acanthus ebracteatus	1.5m	10 cm	2cm	2cm	flowers purple; one bract	
Acanthus ilicifolius					flowers pale blue; one bract and two bracteoles	
Amyema mackayense		6cm	2cm	6mm	ray 3-4	
Amyema thalassium		4cm	2cm	1cm	rays 2	
Avicennia marina	15m	11cm	5mm	2cm	bark green	
Avicennia integra	6m	14cm	1cm		bark brown	
Bruguiera exaristata	8m	11cm	3cm	8cm	petal 1cm	
Bruguiera gymnorrhiza	15m	18cm	4cm	20cm	petal 1.5cm	
Bruguiera parviflora	5m	10cm	2cm	15cm	petal 1mm	
Bruguiera sexangula	12m	11cm	3cm	12cm	petal 1.5cm	
Ceriops decandra	5m	10cm	1cm	15cm	petal 2mm	
Ceriops tagal var. australis		10cm	2cm	10cm	petal 4mm	
Ceriops tagal var. tagal		10cm		25cm		
Cynanchum carnosum		7cm	2cm	7cm	seed 2cm	
Lysiana maritima		4cm	3cm	fruit unobserved in NT	parasite on Excoecaria ovalis	
Osbornia octodonta	6m	5cm	1cm	1cm	leaves gland dotted; odorous when crushed	
Pemphis acidula		2cm	1cm	1cm	leaves shortly hairy; flowers white	
Rhizophora apiculata	15m	19cm	1cm	37cm	inflorescence 1 dichotomy; peduncle < 14 mm long	
Rhizophora lamarckii	25m	13cm	1cm	fruit unobserved in NT	inflorescence 2 dichotomies; peduncle > 18 mm long	
Rhizophora stylosa	10m	12cm	1cm	30cm	inflorescence with 3 dichotomies; underside of leaf evenly dotted	
Scyphiphora hydrophylacea	5m	5cm	1cm	8mm	strongly resinous new growth	
Sonneratia alba	8m	10cm	5cm	3cm	bark longitudinally fissured; coastal habitat	
Sonneratia lanceolata	12m	16cm	5cm	4cm	bark with horizontal rings; upper river habitat	

LEAVES GRASS - LIKE

SPECIES	HABIT	LEAF	FLOWER	FRUIT	FEATURE	DISTRIBN
Cynodon dactylon	0.15m	7cm	4cm	2.5mm	stems above ground	
Sporobolus virginicus	0.4m	15cm	10cm	4mm	stems underground	

LEAVES SIMPLE, ALTERNATE

SPECIES	HABIT	LEAF	FLOWER	FRUIT	FEATURE	DISTRIBN
Aegialitis annulata	1.5m	8cm	1cm	5cm	winged petiole	
Aegiceras corniculatum	5m	8cm	2cm	4cm	flowers white; strong sweet scent	
Camptostemon schultzii	13m	9cm	2cm	2cm	rusty scales on new growth	
Diospyros compacta	11m	10cm	male 7mm	1.5cm	reflexed calyx	
Diospyros littorea	15m	9cm		1cm	calyx clasping fruit	
Excoecaria agallocha	7m	10cm	11cm	1.5cm	latex white, copious	
Excoecaria ovalis	4m	7cm	4cm	1cm		
Hibiscus tiliaceus	8m	20cm	7cm	4cm	elongate nectaries on main veins of leaf	
Lumnitzera littorea	9m	10cm	2cm	2cm	twigs reddish; flowers red	
Lumnitzera racemosa	5m	8cm	1.5cm	1.5cm	twigs grey; flowers white	
Thespesia populneoides	8m	20cm	10 cm	3cm	rounded domatia in axils of main veins of leaf	

LEAVES COMPOUND OR FERN- OR PALM-LIKE

SPECIES	HABIT	LEAF	FLOWER	FRUIT	FEATURE	DISTRIBN
Acrostichum speciosum	1.5m	2m	venation 2cm	sporangia 1mm	clumping fern	
Cynometra iripa	6m	10cm	5mm	3cm	leaves paripinate; leaflets consistently obtuse	
Dalbergia candenatensis	8m	13cm	1cm	4cm	leaves imparipinnate; flowers pale pink	
Derris trifoliata	2m	25cm	1cm	4cm	leaves imparipinnate; flowers white	
Nypa fruticans	9m	9m	carpel 15cm	45cm	clumping palm; stem underground	
Xylocarpus granatum	8m	15cm	5mm	20cm	bark smooth	
Xylocarpus mekongensis	15m	20cm		10cm	bark rough	

LEAVES FLESHY OR APPARENTLY ABSENT

SPECIES	HABIT	LEAF	FLOWER	FRUIT	FEATURE	DISTRIBN
Batis argillicola	0.7m	1cm	7mm	seed 5mm fruit 1cm	leaves opposite	
Halosarcia halocnemoides	0.5m	1cm	2cm	seed 1mm	articles to 5 mm, glossy leaves apparently absent	
Halosarcia indica			4cm	seed 1m	articles to 10 mm, glaucous	
Sesuvium portulacastrum	0.2m	5cm	1cm	seed 1mm	leaves opposite, strap-like	
Suaeda arbusculoides	0.5m	2cm	2mm	seed 2mm	leaves alternate	
Tecticornia australasica	0.4m	2cm	3cm	seed 1.5mm	leaves apparently absent; plant glaucous, annual	

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Compiled by Glenn Wightman, illustrated by Milton Andrews.